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Contractors and Engineers Monthly

Vol. 36, No. 12 DECEMBER, 1939 $2 a Year, 20 Cents a Copy

PENNSYLVANIA TURNPIKE

Highlights Of This Issue

- **Railroad Relocation at Shasta**
  Before work on Shasta Dam could actually get under way, considerable railroad and highway relocation was necessary. The construction of a 4,346-foot railroad bridge over the Sacramento River and a 12.5-mile grading section, involving 38 concrete culverts, are described in this issue.
  See page 2.
- **Big Clamshell Dredge**
  The Alabama, a big clamshell dredge with movable pontoons, was used for channel deepening and levee construction in the Atchafalaya Floodway project in Louisiana.
  See page 2.
- **Floating a Bridge**
  One of the interesting phases of the 6.6-mile Lake Washington Bridge project in Seattle is the concrete pontoon bridge with its sliding draw section, which was poured in a graving dock and floated in sections to the location of the bridge.
  See page 8.
- **Natural Snow Fence**
  Black Hawk County in Iowa, where the tall corn grows, makes successful use of the less spectacular but more average-sized cornstalks as a barrier to snow drifts on its highways. This and other aspects of highway work in this county are described in this issue.
  See page 11.
- **Bituminous Surfacing**
  Three types of surface treatments used on South Carolina state highways and the methods of maintaining them are discussed by the State Highway Maintenance Engineer.
  See page 18.

C. & E. M. Photo
Traffic Striping by State Maintenance Forces on U.S. 1 in East Greenwich, R.I.

Efficient Unit For Traffic Lines

Two Men with Truck and Three-Wheel Applicator Paint 3 to 5 Miles Daily On Rhode Island Roads

✦ ONE of the simplest and smallest, as befits the size of Rhode Island, traffic-line painting units was recently noted at work on U. S. 1 in the Town of East Greenwich. Two men, a Chevrolet truck with delivery body, three 50-gallon drums of paint and gasoline, and the light-weight 3-wheel paint applicator illustrated, make up the unit working from State Highway Department Headquarters at Providence, but garaged at East Greenwich.

(Concluded on page 16)

The Conception and Design Of 160-Mile Super-Highway

(Photos on page 36)

Methods, Men and Equipment On Great Highway Project; This Introductory Article Shows Magnitude of Work

✦ WITH conditions ideal for the construction of the first long super-highway in the United States, the State of Pennsylvania created the Pennsylvania Turnpike Commission, which is now rushing to completion 159.69 miles of four-lane highway across its valleys and through the Allegheny Mountains to connect the eastern seaboard industrial area with the steel mills and granaries of the midwest by a low-grade divided-lane traffic artery. Taking advantage of the foresight of great industrialists and railroad men of the 1880's, including Pennsylvania's own Andrew Carnegie, the Turnpike Commission created by the Legislature on May 21, 1937, purchased the old right-of-way and workings of the abandoned South Penn Railroad for $2,000,000, one-fifth the cost to the original builders in 100-cent dollars. The work of the original builders, some of which, including tunnels, is now being used, represents about 50 per cent of the required tunnel and 5 per cent of the open-cut excavation of the present $61,100,000 project.

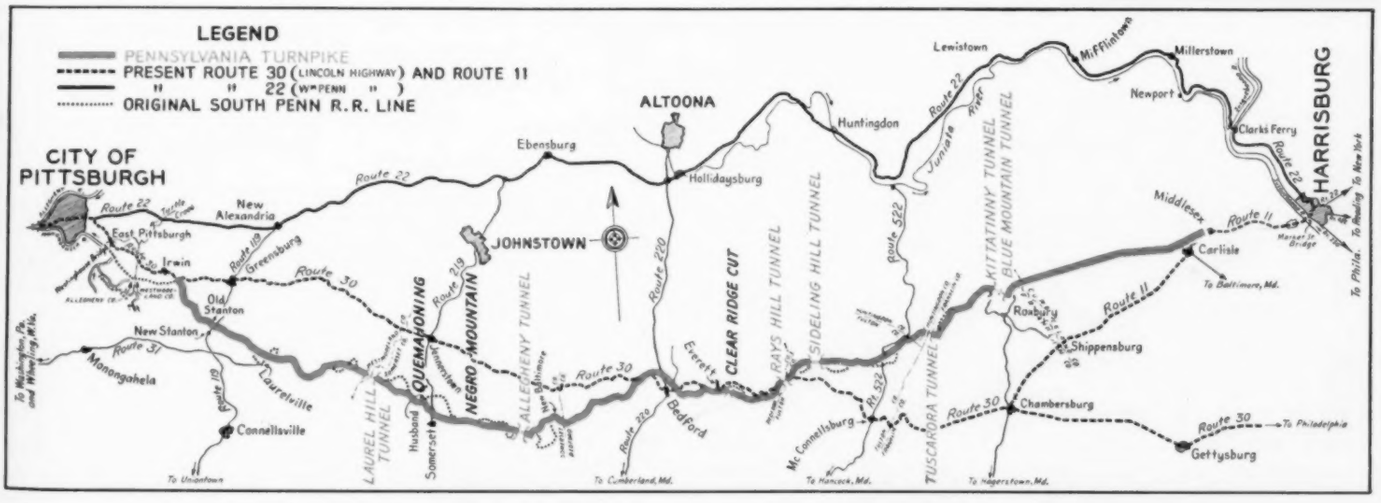
Extending from Middlesex, about 15 miles west of Harrisburg, to Irwin, about 20 miles from the center of Pittsburgh, the Turnpike will have only 6.76 miles of tunnels. The open-cut excavation and right-of-way for the remaining distance is on a maximum grade of 3 per cent and is carried on the south and west slopes of the mountains to minimize the hazards of ice on the traveled way. The new highway will save nearly 11,000 feet of climb compared to the Lincoln Highway, U.S. 30, between the same termini, and the vast savings in curvature have never been computed. Further planning to prevent possible closing of any section of the highway during floods was necessary, particularly in the valley near Bedford where the Raystown Branch of the Juniata River has acted badly several times in recent years. Three major structures in this valley each carry the roadway at least 4 feet above the highest flood elevations on record.

Having received its first allotment of Federal money on October 10, 1938, the Pennsylvania Turnpike Commission started work on the first contract on October 28, 1938, and the first concrete

(Continued on page 6)

IN THIS ISSUE

Bituminous Roads	18
Bridge Construction	2, 8
Cartoon	4
County Road Work	11, 24
Dredging	2
Editorials	4
Legal Decisions	28
Levee Construction	2
Pennsylvania Turnpike	1
Prequalification of Contractors	31
Railroad Relocation	2
Snow Removal	11
Traffic Striping	1
Tunnel Construction	24
Wire Rope	32



Railroad Work at Shasta

Bridge 4,346 Feet Long Over Sacramento River Part of New High-Line Constructed For Southern Pacific Railroad

✦ THE start of the railroad relocation work in connection with the construction of Shasta Dam, by means of which the Bureau of Reclamation will provide a high-line some 30 miles in length north of Redding, Calif., is a bridge at that point spanning the Sacramento River and adjacent lowlands. It is known as the First Sacramento River Crossing and it is 4,346 feet in length. The erection work was divided into two main contracts. Clifford A. Dunn obtained the contract for the substructure for $173,320, and the American Bridge Co., Gary, Ind., for the superstructure, including the permanent deck, on its bid of $569,100. This company in turn sublet the deck to Barrett & Hilp and the field painting to Watson & Morris of Chehalis, Wash.

Dunn finished his part of the work so that steel construction could be started March 7. With as many as 80 men on the job at some stages, the American Bridge Co. pushed the work along so that by June 20 the river spans were completed and 20 towers with one set of girders had been completed on the viaduct that sweeps in a curve over low ground to meet the grade to the north of the river. The bridge was completed in August.

Substructure

The major part of the work for the substructure lay in the four river-crossing piers, numbered 1, 2, 3, and 4, beginning at the south. These piers are founded on rock, excavations being made in the rock to take a slab of concrete 20 x 40 feet and 5 feet in thickness. The base of each pier is 14 x 36 feet, the heights ranging from 80 feet 6 inches to 84 feet 6 inches, with an average of approximately 82 feet. At the top, the width of the piers is 7 feet 6 inches and the length 26 feet 9 inches.

A total of approximately 5,420 cubic yards of concrete was required for the four piers. Excavations for the founding of the piers were made by driving sheet piling to form cofferdams, dewatering and removing excavated material with clamshell buckets.

The contractor then built a temporary trestle out to the location of Pier 2 from the south side. This pier was cast and the trestle removed. The same procedure was followed from the north side for Pier 3. The piers above the foundations were poured in two lifts each. Concrete was mixed on the banks and brought over the temporary trestles, being placed with a crane and 4-yard bucket.

Bureau of Reclamation Photo

A Steel Parade. In the Foreground, the Towers Going Up for the Viaduct Approach to the Bridge, the Completed River Span of Which Is Shown in the Background

Superstructure

Considering the size of the job, the American Bridge Co. made exceptionally good progress. Each of the three river spans is 165 feet long, in eight panels, 28 feet deep center to center of the top and bottom chords. The trusses

(*Concluded on page 19*)

Job Required 38 Concrete Culverts of Various Types; Contractor Gets Culverts Down to a System

✦ A GREAT variety of heavily reinforced concrete culverts are in evidence on a 12.5-mile section of the 30-mile railroad relocation of the Southern Pacific near Shasta Dam in California. All culverts were cast on the site and are divided between the arch and box types, with underpasses, cattle passes and two overhead structures included in the culvert classification. There are 38 in all, above the pipe size, as follows:

Box culverts	27
Arch culverts	5
Underpasses	2
Underpass, pedestrian, 6 x 8 feet	1
Cattle pass, 10 x 10 feet	1
Overhead structures, one 100 feet long and one 135 feet long	2

The largest arch-type culverts, of which there are three, have a height of 15 feet and a maximum width of 13 feet. The smallest arch type is 9 feet 6 inches in height by approximately the same width. Box-type culverts range from 3 x 3 feet up to the largest double ones, each half of which is 7 x 7 feet.

The first thing the contractor, Granfield, Farrar & Carlin of San Francisco, did was to equip a carpenter shop near headquarters at one end of the section. All forms were made at this shop and then transported to the various sites in sections.

Except in the three largest arch culverts, all concrete was placed in one pour, forming monolithic structures from end to end. For the most part, these monoliths each were poured within the period of one 8-hour shift. In some of the boxes, this time had to be extended to 10 hours. Two Jaeger mixers handled this part nicely, one being a 14-S 3-sack size and the other a 10-S 2-sack unit.

Pouring One of the Larger Box-Type Culverts on the Granfield, Farrar & Carlin Grading Job

In setting up the arch forms, provision was made at the bottom on each side for a concrete footing substantially larger in area than the cross-section of the arch itself. The inside and outside arch forms were then set up over the footing forms, the inner one being a complete arch, while a short section of the outer one was left open at the top for finishing the pour, the concrete being formed by hand to the proper curve at that point. To facilitate pouring, portholes were left at intervals in the outer form through which the concrete was introduced, these holes being closed with smoothly fitting inserts as soon as the level of the concrete reached them.

All concrete was vibrated as placed by means of a Viber pneumatic vibrator. When the forms were stripped, a waterproofing solution was applied on the outside surface, using a spray gun, and just covering the surface. A second coat was applied after the first had dried. This solution was furnished by the Bureau of Reclamation for whom the work was being done.

The Bureau specifications also provided for compacting the earth around each culvert to a specified distance and degree. This was done by means of two kinds of tampers, one an Ingersoll-Rand pneumatic and the other a Barco gasoline-powered type.

Big Clamshell Dredge Has Movable Pontoons

McWilliams Dredging Co. Used the Alabama to Enlarge Navigable Canal At Baldwin, La.

✦ THE new Wax Lake levee south of Patterson, La., while acting as a protection to Charenton, Baldwin and Franklin, La., against high water coming down the new Atchafalaya Floodway and entering the Gulf of Mexico through the Wax Lake Outlet, has cut navigation through Bayou Teche. To restore a navigable route, a new cut was made at Baldwin, La., entering the Teche and connecting with the Intra-coastal Canal.

Items A and B of the Charenton Drainage and Navigation Canal project provide for a new channel between the West Protection Levee borrow pit and Bayou Teche near Charenton, La., and an enlargement of Bayou Teche between Charenton and Baldwin, La. The latter portion comprises Item B.

The Charenton Drainage and Navigation Canal has a two-fold purpose as indicated by the name of the project. One is to provide navigation from Bayou Teche to the Intracoastal Canal, which is necessary because the Wax Lake Outlet will eventually cross the Teche with guide levees on each side. The West Guide Levee was constructed with landside borrow pits which provide an artificial channel for all intercepted drainage. Therefore, since the West Guide Levee connects with the guide levee of the Wax Lake Outlet, it is necessary to have an outlet for the intercepted drainage, which is the other purpose of the project.

The McWilliams Dredging Co. of New Orleans, La., which was awarded the contract to move 2,475,000 cubic yards at 4.930 cents, put in the clamshell dredge Alabama on Item B to move 1,402,500 yards. The canal was dredged to a 150-foot bottom at —15 MGL (Mean Gulf Level) with a 1 on 1 slope, giving a 180-foot width at the top. The spoil was placed on the bank, leaving a 60-foot berm from the canal bank, and with a 1 on 4 slope to elevation +16 MGL. Above that, the spoil bank may rise to any height with a 1 on 25 slope. The spoil bank was trimmed to a smooth face with a tractor and bulldozer.

The Clamshell Dredge Alabama

The hull of the Alabama is constructed of electric-welded steel and is 140 feet long, 49 feet wide and 9 feet deep. It was built by the Ingalls Iron Works at Mobile, Ala., in 1934 from designs of

(*Concluded on page 30*)

The American Bridge Co. Used Three Standard Falsework Bents Per Span. A 150-Ton Locomotive Crane Handled the Bulk of the Erection of This Railroad Bridge over the Sacramento River Near the Site of Shasta Dam.

The Award Winners

The announcement of the four sectional winners of the 1939 Contractors and Engineers Monthly Roadside Development Awards for highway contractors will be made in our January issue.

The winner of the National Award will be announced at the Annual Banquet of the American Road Builders' Association on January 31 in Chicago, when all of the Awards will be presented.

C. & E. M. Photo

The 5-Yard Clamshell Bucket on the Dredge Alabama

A common road problem

The loose, dusty gravel surface, which formerly served an 18-mile road in the vicinity of Lincoln Log Cabin State Park in central Illinois.

And how it was solved

The same road being resurfaced with a low-cost Intermediate-Type Asphalt surface.

An 18-mile highway near Lincoln Log Cabin State Park, Illinois, had a loose, dusty gravel surface.

How to convert this road into an all-weather, skidproof, easy-riding highway at moderate cost was the problem.

Illinois decided that an Intermediate-Type Asphalt surface fulfilled all the requirements. The old road was primed with a suitable Cutback Asphalt. A plant-mixed surface of Cutback Asphalt and stone was machine-spread to a loose thickness of 3 inches and rolled. Then followed a tack coat of Cutback, a layer of coated keystone and two applications of Cutback, each of which was sanded.

There is an important place for low-cost Intermediate Type TEXACO Asphalt surfaces in every road and street system. For a helpful description of these surfaces, write for our booklet, "Asphalt Roads — Intermediate Types."

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Saluting the Pennsylvania Turnpike

A project of the vastness and importance of the Pennsylvania Turnpike between Harrisburg and Pittsburgh, Pa., cannot be adequately described by a single long general article nor merely by a series of methods articles. Hence in this issue we introduce the Pennsylvania Turnpike to our readers in one general article describing the project, its design and the problems faced by the group of contractors who are faithfully and speedily creating this new utility from the plans of the engineers of the Pennsylvania Turnpike Commission.

Following this introductory article, in succeeding issues will appear a series of detailed methods articles of the type which CONTRACTORS AND ENGINEERS MONTHLY presents regularly to its 28,000 readers. This series of articles will cover different approaches to tunneling problems, such as enlarging the old unfinished double-track and single-track tunnels of the South Penn Railroad, the types of jumbos used, methods of ventilation, as well as full-face and bench tunneling. Then there are the varied methods of handling the huge rock cuts, excavation in earth and large fills, the construction of the different types of bridges, and finally, paving methods under the newest specifications and design.

These articles are the result of days of patient study in the field of the methods, equipment and organization of the group of progressive contractors who have undertaken this monumental project. To hasten completion, there are numerous subcontractors on many of the sections, each handling his part of the work with a different type of equipment and a different method of attack. This series of articles which will appear for the next six months in CONTRACTORS AND ENGINEERS MONTHLY will bring you countless new ideas to speed up your work, because under the June 29, 1940 "substantial completion" date these contractors are working on "calendar day" and not "working day" contracts. They are therefore on their toes to complete the job without penalties and in the best possible manner with a reasonable profit to themselves. To this end they have devised many new methods and purchased much new equipment, some of it never used before in construction.

"Ideal", "Miracle" or "Dream" Roads

Engineers are not romanticists, so we can smile with them at the names given to some of the highways they have designed and built, names coined by publicists for promotional purposes. The not-so-old Timers will remember the publicity given to the group of engineers, the best of their day, who designed the "Ideal Section" of the Lincoln Highway, which was built in northwestern Indiana. They designed in the early days of concrete highway construction, they disagreed on the dowel connections at transverse expansion joints, compromised, and the "Ideal" section failed. But it taught a lesson in design, it established new visions of highway service, attractiveness and safety, and was the reality from which present-day thought in highway design and construction started.

Engineers do not perform "miracles." They are very practical individuals, and the contractors who take their designs and transform them into realities are neither alchemists nor prestidigitators; they deal in very solid materials which combine for service, utility and, let us be thankful, attractive structures and highways. Hence when publicists dubbed the new project at the north entrance to Tucson, Arizona, "The Miracle Mile" we smiled. But those forward-looking engineers and practical contractors have produced a section of highway on the outskirts of Tucson which has lifted a dreary approach to a thing of beauty, raised an inadequate traffic artery to one capable of receiving and distributing its varied traffic with a maximum of safety, and provided parking facilities by means of bays at the sides of the roadway for vehicles owned by residents living along the route. This was not a miracle, but sound, creative engineering and construction.

Now we have what many are calling the "Dream Highway" in Pennsylvania, probably so named because of the appeal to the popular mind. The Pennsylvania Turnpike, the features of which are described in this issue, is fast advancing from the "dream" stage to become an actuality. Taking advantage of an abandoned railroad right-of-way, the relict of an unsuccessful venture of the 1880's, and the opportunity of Federal financing through PWA and RFC, the nightmare of providing the funds was overcome. This practical project defeats Nature's barriers, the Allegheny Mountains, which cut across the east and west thoroughfares of the Keystone State and made cross-country travel for modern motor cars a combination of calisthenics in steering around multiple S-curves, and a game of patience or chess in trying to out-guess slow-moving heavy trucks on long, steep grades. Thoughtful planning, careful engineering design and forward-looking traffic studies combined to secure the necessary financing of the Pennsylvania Turnpike, not a "Dream Highway" but the modern "Reality Route."

Engineers design and contractors build; they both have ideals of sound financing and construction, they work no miracles, and their major dreams are of some day laying aside sufficient funds to warrant retirement from the exacting task of creating our public works.

Judge Sees Awards Stimulating Roadside Development Work

To the Editor
CONTRACTORS AND ENGINEERS MONTHLY

As a nation, we are justly proud of the 3,000,000 miles of roads and highways that link together our thousands of towns and cities. We undoubtedly have one of the most efficient roadway systems on the face of the earth. Yet it is a notable fact that we have too long neglected highway development in the fullest sense of the word. In concentrating our efforts on construction of high-speed roadways, we have frequently overlooked the areas that lie immediately adjacent. As a result, many of our roadsides today are unattractive, badly drained, and even, in some cases, a definite hazard to safe motor traffic.

The question of adequate roadside drainage is of interest not only to the motoring public and to officials responsible for highway maintenance, but also to the farmers who till the adjacent fields. Altogether too much farm land in the United States has been damaged and even ruined by gullies cutting back from highway ditches that were poorly designed and poorly protected.

The need for better roadsides in this country has long been apparent on every hand and from every point of view. Consequently, the awards being offered by CONTRACTORS AND ENGINEERS MONTHLY are a source of real encouragement. Out of efforts of this kind will come the roadsides of tomorrow—roadsides that blend gracefully into the surrounding landscape, roadsides that carry away storm waters efficiently and safely, roadsides that contribute to the safety and pleasure of travel on the highway.

Sincerely yours,
H. H. Bennett, Chief,
Soil Conservation Service,
Dept. of Agriculture

Washington, D. C.
September 22, 1939

(Editor's Note: Mr. Bennett is one of the National Judges for the 1939 Annual Roadside Development Awards.)

Providing for Traffic In Metropolitan Area

In a paper on remedies for traffic congestion in metropolitan districts before the Twenty-Fifth Annual Purdue Road School, Robert B. Brooks, Consulting Engineer and Member of the Missouri State Highway Commission, pointed to Wayne County, Mich., with its metropolitan district centering in Detroit, as an outstanding example of advanced planning which helped to provide remedies for traffic congestion.

Leroy C. Smith, Chief Engineer of the Wayne County Road Commission, says, "A condition of uncertainty would exist in the attempt to provide trunk-line highways for metropolitan areas were it not for the salient fact that rights-of-way may be acquired immediately and actual pavement construction left to follow as the need develops.

"The first step in a metropolitan trunk-line plan is therefore the selection of rights-of-way wide enough for ultimate development. For trunk-line highways in the Detroit area, a minimum width of 120 feet is provided. Secondary highways have a minimum width of right-of-way of 86 feet, and super-highways, 204 feet. For boulevards, a right-of-way of 150 feet is a practical minimum and parkway rights-of-way should not be less than 200 feet in width."

The master plan for the metropolitan area of Detroit, adopted in 1925 by the authorities controlling metropolitan streets and roads, dealt primarily with conditions within a 15-mile circle from City Hall. The six super-highways called for in that plan have been made 204 feet wide within the 15-mile circle and 120 feet wide for many miles beyond that limit, surpassing their planned dimensions. Over 80 per cent of the 204-foot rights-of-way for these highways have been secured. In addition, double pavement sufficient for present needs has been built on these radial arteries and on seven other super-highways.

The entire original master plan is thus almost a reality today insofar as ultimate rights-of-way are concerned.

"This progress," Mr. Smith says, "has been attained on a pay-as-you-go basis without issuance of bonds, as a result of unanimous adoption of the plan, legislation enforcing the plan on property subdividers, adequate condemnation legislation, and conservation of automobile taxes for highways uses."

"Sleepwalkin'—Hell! He's Just Checkin' Up to See If I'm on the Job!"

The Place of Highways In Our National Life

Making public the results of a stock-taking of the effects of highway transportation upon our national life, the National Highway Users' Conference has published its findings in a 32-page booklet entitled "Highway Transportation Re-Makes America" and at the same time issues a warning that this country's traditional concepts of freedom of the highways are being threatened.

Highlighted by the statement that roads and their use are responsible for the employment of more than 6,000,000 persons in the United States, the Conference's observations contained in this booklet range through a study of social and economic aspects of highway transportation to the obvious relationship with national defense, and a discussion of the tax burden on highway users.

The Conference concludes its review of the highway transportation situation with a declaration for "the protection and preservation of the rights of the individual to transport himself, his family, his friends and his goods in his own conveyance. Freedom of the highways must be preserved to a free people."

Copies of this booklet "Highway Transportation Re-Makes America" may be secured without charge by readers of CONTRACTORS AND ENGINEERS MONTHLY direct from the National Highway Users' Conference, National Press Bldg., Washington, D. C.

Vermont Bridge Designs Based on Flood Data

The purpose of a highway bridge is not only to carry the road across a stream, but also to pass the stream under the road. Thus a consideration of what volume of water can be accommodated beneath a bridge before washing it out is just as important as how much traffic can be carried. The design of waterways involve such factors as the height of a bridge, the placement of piers and abutments, and length and number of spans.

In Vermont, according to the latest report of the Vermont Department of Highways, the statistics from the floods of 1927 and 1936 are being utilized in the design of all new and reconstructed bridges so that they will be able to withstand all probable abnormal conditions.

Armco Culvert Assn. Announces New Name

The Armco Culvert Manufacturers Association, Middletown, Ohio, organized in 1904, two years before the introduction of Armco "pure iron" by The American Rolling Mill Co., has recently changed its name to Armco Drainage Products Association, because of the changing trends in its business. This Association has done much to raise the position of the corrugated iron pipe from that of "wrinkled tin" to that of a highly respected modern drainage tool used under severe service conditions.

The officers of the Association are: W. H. O'Neall, President; H. W. Force, Vice President; and M. F. Shelt, Secretary-Treasurer. The headquarters staff at Middletown is in charge of S. R. Ives, Vice President and General Manager, with M. C. Patton, Assistant Manager; G. E. Shafer, Chief Engineer; and W. H. Spindler, Publicity Manager.

Anti-Freeze for Air Lines

A new bulletin has just been issued by Sullivan Machinery Co., Michigan City, Ind., on Tannergas and Frosto vaporizer. Tannergas is used on temporary air-compressor installations, or where electric current is not available. Frosto is used on permanent installations, where electric current can be obtained. An entirely new development is the Frosto vaporizer for portable compressors. All of these types are guaranteed to prevent freezing of compressed air down to 70 degrees below zero.

These three systems are described completely, with details of installation, in Bulletin R-16, which may be secured direct from the manufacturer.

Equip Motor Graders For Snow-Removal Work

An effective four-page bulletin, Form 5796, has been issued by Caterpillar Tractor Co., Peoria, Ill., showing just how V-type and reversible one-way snow plows, as well as mast-type snow wings, can be attached to Caterpillar motor graders for effective work in light and heavy snows.

Copies of this bulletin will be sent free to any reader of CONTRACTORS AND ENGINEERS MONTHLY writing to the manufacturer and mentioning this item.

LOW COST
STANDARD OIL
ASPHALT
ROADS

● Evidently the gentleman above didn't see last month's ad or he would have known that there is a better way out of his trouble. Like most highway officials he *has* trouble. It's a real problem to build *adequate* all weather roads or streets and still keep within highway fund allotments.

But it is a problem that can be solved. The Standard Oil Asphalt representative in your locality can help you. First, he can help pick the right type of asphalt road construction for your needs. Available aggregate, traffic requirements and other local factors are carefully considered. Then he can recommend the exact grade of asphalt or road oil needed from the wide range of Standard Oil asphalt products.

Let one of these asphalt representatives in on your problem. You can reach him through the local Standard Oil (Indiana) office or by writing 910 South Michigan Avenue, Chicago, Illinois.

Asphalt for every purpose STANDARD OIL COMPANY (INDIANA)

Planning the 160-Mile Pennsylvania Turnpike

(*Continued from page 1*)

paving was laid August 17, 1939. The date of "substantial completion" required by PWA is June 29, 1940, and present construction schedules provide for meeting that date. This vast project has been conceived and placed under contract in record time. The limits of production and weather are the only delays that now seem to stand in the way of actual completion on the "substantial completion" date. A mild winter, or better an early spring, will be of inestimable value to the paving contractors and the Commission. Tunnel concreting can continue all winter with heated aggregate and closed portals.

This single project will require, for the roadway, 2,115,260 barrels of cement, 641,058 tons of sand, 1,153,225 tons of stone, and 29,475 net tons of structural and reinforcing steel. The excavation for cuts and fills comes to the astounding total of 24,549,740 cubic yards, varying from sand to the hardest limestone, but mostly a disintegrated shale, much of which could be rooted and removed with scrapers, while other sections require heavy use of explosives, 40 to 60 per cent dynamite, and shovel-loading to steel-bodied trucks, trailer-trucks, rock buggies and other self-powered equipment. There will be 4,300,000 square yards of reinforced-concrete pavement 9 inches thick, 46,642 square yards of concrete bridge surfacing 2½ inches thick and 95,000 cubic yards of Class A and 176,500 cubic yards of Class B concrete in structures, and 150,000 square yards of bituminous-macadam paving for approach roads.

Probable Extension

Already, with the actual completion date months distant, talk of extending the Turnpike is in the air and the Commission's Planning Engineers are busy working on routes and estimates to carry the highway to Philadelphia. Similar extension to the Ohio line should be given serious consideration if the vast peace-time economic and defensive military values of the highway are to be realized to the greatest extent.

From the present economic angle the Turnpike has been a vast reservoir of employment, attracting skilled labor from afar and absorbing all able-bodied unemployed unskilled labor for many miles north and south of the 160-mile right-of-way.

Financing

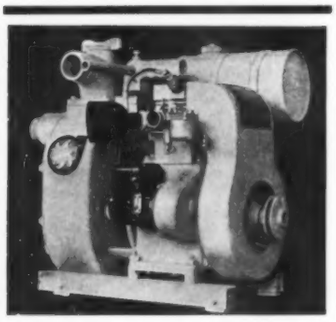
This vast project, which will be of such great benefit to Pennsylvania, as well as to all motor traffic which must traverse the Keystone State, is being financed solely by Federal funds except for some WPA funds for preliminary surveys. The PWA made a 45 per cent grant of $26,100,000 and the Reconstruction Finance Corp. has purchased a total of $35,000,000 of the 3¾-per cent bonds of the Commission which, it is expected, will be amortized by 1954 through the tolls which will be collected from motor vehicles using the highway. When paid for completely by the tolls, the highway is to become a free road and be turned over to the State of Pennsylvania for operation by the State Highway Department, according to the original plan. The tolls suggested to but not yet acted upon by the Commission indicate $1.25 for a passenger car with passengers for the length of the highway, while the tolls for trucks for the through trip will vary, according to weight, from $4.00 to $10.00. For trips for only a part of the highway the toll will be commensurate with the facilities offered. In time of emergency the motor vehicles of the Federal Government may use the Turnpike toll-free.

The toll structure and the subsequent sale of bonds to the R.F.C. was based on engineering estimates made by E. L. MacDonald of Parsons, Klapp, Brinckerhoff & Douglas of New York, whose report shows that approximately 1,000,000 automobiles and 300,000 motor trucks may be expected to use the highway during its first twelve months of operation. This would produce $2,670,000 in tolls. After a deduction of $408,000 for operation and maintenance costs, the net income from the Turnpike in its first year should be about $2,262,000. The use of the highway is expected to increase yearly until a total of more than 2,000,000 vehicles will be using it annually by 1945, which would produce a revenue of more than $4,000,000.

C. & E. M. Photo
The Sign at Irwin, the Western End of the Turnpike

In the engineering survey on traffic it was determined that the Pennsylvania Railroad alone has 3,000 vans which will use the Turnpike regularly and consequently will be a big revenue factor. Also, about twenty large motor

(*Continued on next page*)



2" Light-Weight

High-capacity, Self-priming Pump

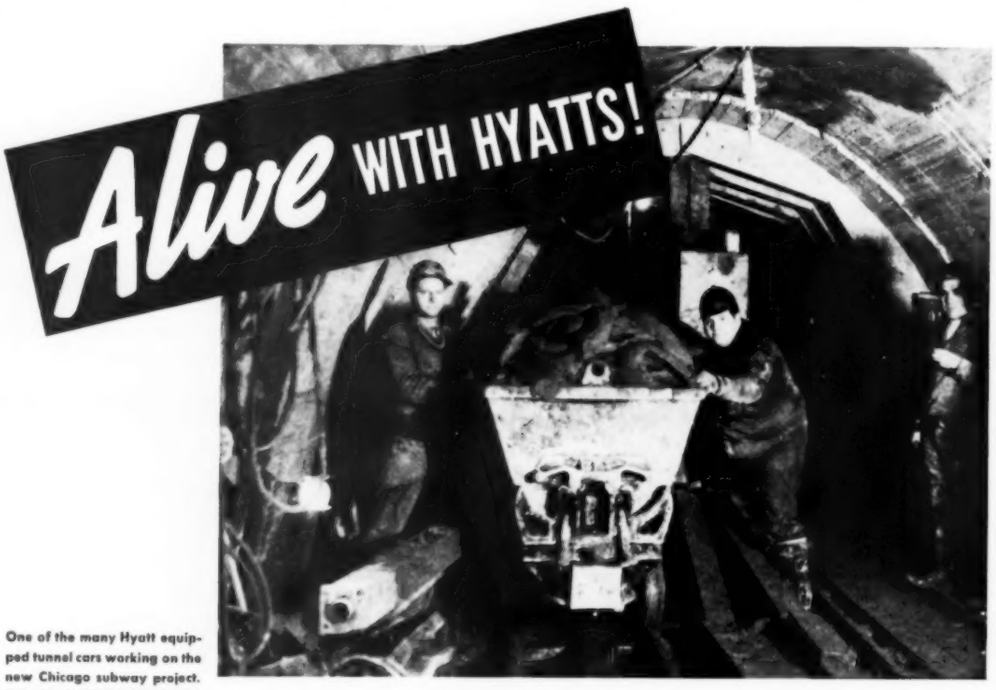
Total weight 97 pounds, including 2-hp. air-cooled engine. Guaranteed self-priming up to 25'. Total head 50'. 8,000 g.p.h.

Ask for Bulletin 22-W

Made by

MARLOW PUMPS

Ridgewood New Jersey



One of the many Hyatt equipped tunnel cars working on the new Chicago subway project. Built by **KOPPEL DIVISION, PRESSED STEEL CAR CO., PITTSBURGH.**

LOOK in on any busy road building or constructing job and you'll see cars, shovels, scrapers, rollers, mixers, engines, hoists, tractors, trucks . . . equipment of every make and kind, *alive* with Hyatts . . . alert to the industry's needs in the Whirl of Today and Tomorrow . . . chalking up new high marks of efficiency, economy, and long life. With Hyatts you can keep your equipment always on the go, too. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, New Jersey; Chicago, Pittsburgh, Detroit and San Francisco.

HYATT *Roller* BEARINGS

Design of Toll Road Across Pennsylvania

(*Continued from preceding page*)

haulage companies are planning to use the Turnpike upon completion instead of routing their trucks between Cleveland and New York via U.S. 30. This will effect a saving of 145 miles between the two cities and the vehicles will not be subjected to the wear and tear of long, steep grades negotiated in first and similar wear through the use of the motors in low gear for braking downgrade. It should be pointed out that the trucks which will pay the heaviest toll, $10.00, will be heavy trailer trucks weighing from 30,000 to 62,000 pounds. The actual operating saving for these trucks will be up to $27.00 through the use of the Turnpike instead of present routes.

It is further estimated by the Commission that the State of Pennsylvania will benefit financially from the operation of the Turnpike by the Commission until 1954 through the collection of an estimated $7,500,000 in increased gasoline taxes paid by Turnpike users during this time. No announcement has been made, however, of what facilities are to be provided on the Turnpike itself for the sale of gasoline to users. The Commission also estimates that it will have a surplus of nearly $3,000,000 at the end of the 15-year period which it is expected will be turned over to the motor fund of the State.

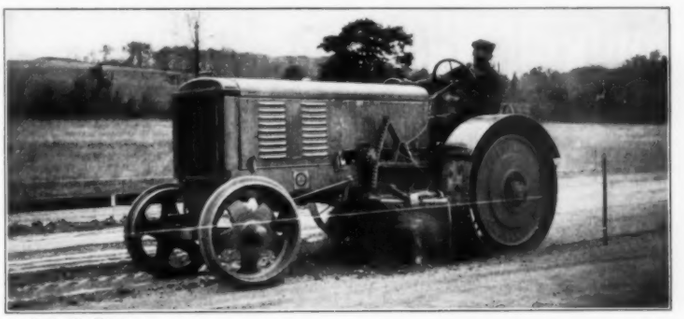
The inauguration of a project of this type is a tremendous task. The engineers of the Commission were faced with the construction of the largest single highway project ever undertaken in this country and with a deadline for completion which meant speed in planning and in execution. From the main office in Harrisburg plans and proposals poured out rapidly. The Commission opened a school for its inspectors, practically all of whom had had previous experience in state highway work but it wanted every one of them conversant with all the innovations of the Turnpike's own modern specifications.

To assist contractors in bidding, a complete list of railroad shipping points adjacent to the Pennsylvania Turnpike arranged by counties and townships, listing the approximate distance to the Turnpike route and giving the name of the railroad and its location with respect to the Turnpike, were issued with all requests for proposals. A similar tabulation was provided, showing sources of electric power available within a reasonable distance of the Turnpike. This was done particularly for contractors bidding on Laurel Hill, Allegheny, Rays Hill, Sideling Hill, Kittatinny and Blue Mountain tunnels. Further, land for stockpiles was arranged for by the Commission engineers so that contractors could operate quarries in winter and stockpile aggregate on these areas throughout the winter for spring paving.

Design of the Roadway

For practically the entire length of the Turnpike, outside of tunnels, a 200-foot right-of-way is available which is being graded 78 feet wide for two 12-foot roadways in each direction, separated by a 10-foot parkway in the center and with 10-foot shoulders, or berms, on the outside on fills and 7-foot shoulders with a 3-foot drainage ditch on the outside in cuts. In tunnels the roadway will be reduced to one 12-foot lane in each direction separated by a 5-foot center strip.

The 10-foot center strip in the open and the 5-foot center strip in the tunnels is composed of compacted shale borrow and contains the main surface-drainage system as described under "Drainage" below. The concrete roadway is 9-inch uniform thickness sloped 1¼ inch in 12 feet for the inside strip and 1¾ inches in the 12-foot outside strip. These two strips are poured separately but are bonded by dowels. The 10-foot berm or shoulder has a slope of 1 inch per foot, while in cuts the outer 3 feet is sloped 3 in 1. All fills are sloped 1½ to 1, both in earth and rock, while backslopes in cuts are 1 to 1 for earth and 1¼ to 1 in rock except where the materials require special treatment.



C. & E. M. Photo

The Union Paving Co. of Philadelphia, Which Had Contract 50 for 8.12 Miles of Concrete Paving on the Turnpike, Used This Cleveland Formgrader for Cutting Trench

Grades

There will be no zero grade on the Turnpike from end to end, the lowest being 0.25 per cent and the maximum ascending grade 3 per cent. Those of our readers who have driven across Pennsylvania on U.S. 30 or U.S. 22 will recall the very heavy grades, as high as 12 per cent, and the tedious driving behind heavy trucks which we have clocked at as low as 3 miles an hour, and will begin to appreciate the potential value of the new Turnpike. Add to this the

(*Continued on page 14*)

NEW JERSEY
NEW YORK
MASSACHUSETTS
PENNSYLVANIA
3 NEW 1 3/4-YD. LORAIN-80's Make
43 LORAINS
FOR GEO. M. BREWSTER & SON, INC., BOGOTA, N. J.
• 43 Lorains purchased over a period of 9 years! So what? Just this—Geo. M. Brewster & Son, Inc. bought their first Lorain in 1930. Its performance was so convincing, they have since chosen Lorain equipment for handling millions of yards of dirt and rock—and at present have Lorains on contracts totaling over 12,000,000 yds. The 43 Lorains used by them represent practically every unit in the line—shovels, cranes, draglines and backdiggers, ranging from ¾ to 2-yd. capacity.
In other words, these successful contractors have found it to their advantage to play Lorains straight across the board regardless of type or size. And you'll find them a sure bet, too, because all Lorains are built to Center Drive design—a time-proven feature that makes for greater simplicity, added power, speed and strength—hence, greater profits.
Write for catalogs describing ⅜ to 2½-yd. Lorains
THE THEW SHOVEL CO. • LORAIN, OHIO
NEW JERSEY
—1½-yd. Diesel Lorain-79 dragline averages 1200 yds. per 8 hrs. on this 100,000 yd. reservoir contract of Geo. M. Brewster & Son, Inc.
NEW YORK
—¾-yd. Lorain-40A backdigger of Geo. M. Brewster & Son, Inc. digs drains, ditches; handles small jobs on the New York Acqueduct near Lackawack, N. Y.
MASSACHUSETTS
—This new 1¾-yd. Lorain-80 is one of two Lorains being used by Geo. M. Brewster & Son, Inc. on the 1,000,000 yd. Knightville Dam near Huntington, Mass.
PENNSYLVANIA
Geo. M. Brewster & Son, Inc. uses these two 2-yd. Lorain-87's to dig 650,000 yds. of solid rock for a spillway on the Crooked Creek (Pa.) Dam. Brewster has a total of 5 Lorains on this job which totals 3,000,000 yds.
SEE THESE MODERN MACHINES and METHODS AT THE CHICAGO ROAD SHOW JAN. 29—FEB. 2
THEW CENTER DRIVE

GRIFFIN
WELLPOINT SYSTEMS
DRY WET JOBS
AT A PROFIT!
Write for new catalog, "Pointed Wellpoint Facts"
GRIFFIN WELLPOINT CORP.
725 East 140th St., New York, N. Y.
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Concrete Pontoon Bridge Feature of Seattle Project

Diversity of Work Found In the Eleven Sections of 6.6-Mile Lake Washington Bridge Project

By HENRY W. YOUNG

✦ ELEVEN separate contracts are involved in the construction of the Lake Washington Bridge in Seattle. Approximately $8,000,000 was the total amount of these contracts when awarded, although there have been some changes in certain phases of the work since then which will reduce the total by a few hundred thousand. The first work was started during December 1938 and the completion date is scheduled for June 30, 1940.

From an engineering and construction standpoint, the project is unusually interesting on account of the variety of work undertaken in a distance of 6.6 miles. The outstanding feature is the 6,561-foot reinforced-concrete pontoon bridge. In the steel and concrete approaches to this pontoon, the tunnel driven under a ridge back into the city from near the west end of the bridge, the city paving and overpasses, grade separations, grading and paving four-lane highways, the bridge over the east channel of the lake, and viaduct over Mercer Slough, there is about every type of road building and bridge construction which ever is encountered in highway work.

The object of the Lake Washington Bridge project is to form a link in a new and shorter route from the city of Seattle to eastern Washington, via Issaquah, which is 26 miles east of the end of the bridge. It is a PWA project, distinct from the section which is to follow from Mercer Slough to Issaquah over a new route. The latter will probably be started next year and is to be built out of Washington state highway funds. Beyond that, from Issaquah eastward to North Bend, a highway is planned, considerably shorter than the present route through Snoqualmie. Therefore, the bridge, together with the two other sections just mentioned, will afford the Sunset Highway entrance to Seattle from North Bend over a much shorter and almost straight alignment.

To be exact, the distance saved will be about 14 miles and the curvature reduction will be from 5,000 degrees to approximately 1,000 degrees. To the truck operator, this means a time saving of at least an hour between North Bend and Seattle.

Lake Washington Bridge is financed by a PWA grant of $3,794,000 and a private bond issue of $5,060,400. It is one of the projects of the Washington Toll Bridge Authority, set up by State Law in 1937, the authority being vested in five members consisting of the Governor, State Auditor and three others. The engineering work and supervision comes under the Washington Department of Highways, Lacey V. Murrow, Director, and R. M. Murray, Bridge Engineer, with Charles E. Andrew of Seattle, Chief Consulting Engineer and R. B. McMinn of Portland, Ore., R. H. Thompson of Seattle and L. E. Gregory of Olympia, Members of the Consulting Board.

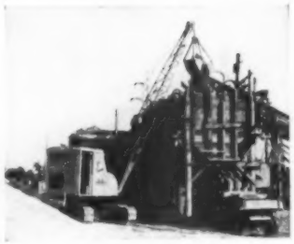
Aerial View of the Lake Washington Bridge Project and Relocation of State Route 2

Description of Project

The best way to visualize this Lake

(Concluded on page 20)

OSGOOD



Power Shovels
Draglines
Cranes, Etc.

Write for New Descriptive Bulletins

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Bethlehem Reinforcing Bars
from Warehouses in
All major construction areas

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GENERAL OFFICES:
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Bethlehem Reinforcing Bars are also obtainable from jobbers in all parts of the country.

BETHLEHEM STEEL COMPANY
BETHLEHEM STEEL

Clearing Snow Drifts From Roads and Ditches

With snow already on many roads in the north, engineers are figuring what snow banks will cost them when spring thaws set in. If the ditches are full and piled high with snow, they cannot drain the roads and therefore the foundations are weakened and the bituminous or concrete surface won't carry the load.

Klauer Mfg. Co., Dubuque, Iowa, has developed several sizes of Snogo rotary plows for state and county budgets, which are adapted to high-speed winter maintenance for cutting through snow drifts and throwing the snow clear of the right-of-way so that there will be no trouble with piles of snow on the shoulder when the spring thaw begins.

Complete information on this Snogo service may be secured direct from the manufacturer by mentioning this item.

Gar Wood Appointments

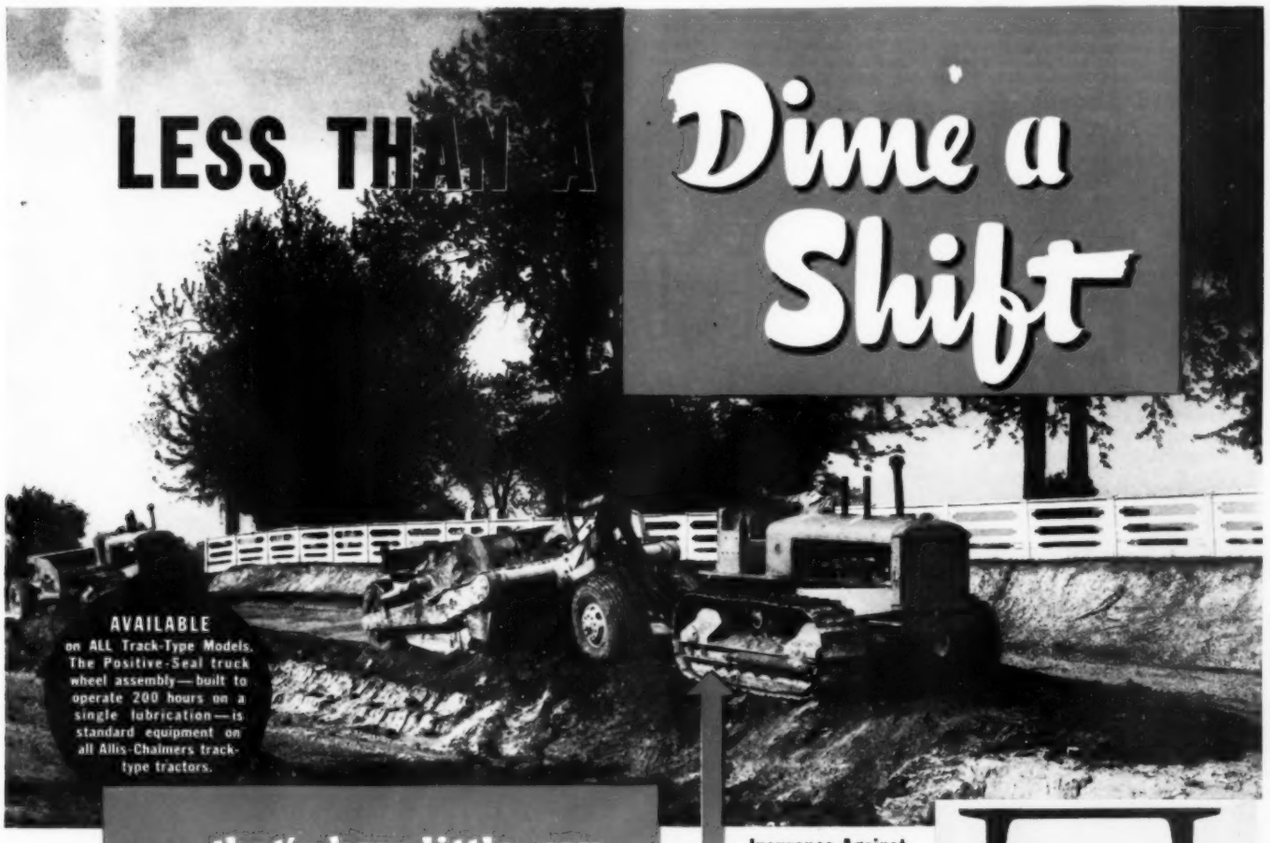
The appointment of I. C. Moreau as assistant to L. S. Wood, Vice President in charge of Engineering of Gar Wood Industries, Inc., Detroit, Mich., has recently been announced. Mr. Moreau's duties are to be confined to engineering work in the company's Hoist and Body Division.

The following recent appointments of hoist and body distributors have been announced: Robert P. Stapp, 209 S. 18th St., Birmingham, Ala.; Lundberg Equipment Co., 257 N. Main St., Logan, Utah; Cate Equipment Co., 722 S. State St., Salt Lake City, Utah; and Wilson Equipment & Supply Co., 902 West 22nd St., Cheyenne, Wyo. M. P. Arnold has been made Buffalo Branch Representative at Rochester, N. Y.

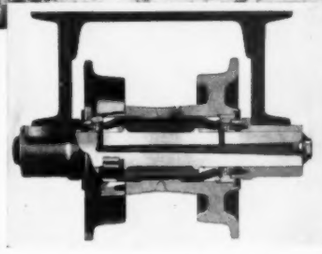
Accident Prevention by Simple Reflector Units

A 16-page bulletin filled with interesting photographs of installations of Prismo Permi-Base waterproof weather-resistant material for making your own reflector signs has been issued by the Prismo Safety Corp., Huntingdon, Pa. It not only contains illustrations, but also a sample of Prismo Permi-Base for the reader to test for himself.

Copies of Bulletin 939 will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY free on request.


LESS THAN A
Dime a Shift
AVAILABLE
on ALL Track-Type Models. The Positive-Seal truck wheel assembly—built to operate 200 hours on a single lubrication—is standard equipment on all Allis-Chalmers track-type tractors.

. . . that's how little you spend on track lubrication bills with the NEW POSITIVE-SEAL TRUCK WHEEL ASSEMBLY.



Insurance Against Time Losses—The new Positive-Seal truck wheel assembly keeps in lubricant, seals out dust, dirt, mud and grit. Result: Time losses for track repairs are practically nil.

Eliminate daily greasing and save yourself $706 or more per tractor! The new Positive-Seal idlers and truck wheels on Allis-Chalmers tractors *operate 200 hours on a single lubrication.* Here's what this money-making feature can mean to you:

Ordinary 80-95 H.P. tractors require 10 lbs. of grease for rollers and idlers plus 30 minutes greasing time, every shift. That's at least 10,000 lbs. and 500 non-productive hours for every 10,000-hour period. Cost of grease alone at 8c* is $800.

Compare "L" and "L-O" figures. Now you lubricate the front idlers and truck wheels but *once in 200 hours.* Only 3¾ gals. of lubricant @ 50c per gal. are necessary . . . 187½ gals. in 10,000 hours, costing only $93.75, and requiring but 25 lubricating hours.

* Runs 10 to 12c in most states.

Cost per hour for track lubricant is less than 1c! In addition, you gain 475 productive hours—more than two working months—on greasing time. Think of the profitable extra yardage you can move in that extra operating time.

Step up profits . . . take advantage NOW of this great time and money-saving feature . . . pioneered by Allis-Chalmers and available only on A-C tractors. See for yourself . . . on your own job . . . what these *faster powered* tractors can do for you. Ask your Allis-Chalmers dealer to demonstrate.

ALLIS-CHALMERS POWER

TRACTOR DIVISION—MILWAUKEE, U.S.A. TRACTORS, ENGINES, ROAD MACHINERY

IT DOESN'T COST .. it Pays!

One of the New American Gopher ¾-Yard Shovels

New 3/4-Yard Shovel Handles Like a Car

According to the American Hoist & Derrick Co., St. Paul, Minn., the new Model 375 ¾-yard American Gopher excavator is speedy, versatile and handles like an automobile. Simple in design and rugged in construction, this new convertible machine has the necessary working weight in the machinery itself instead of being hung on the rear as dead counterweight.

Features of this new machine, which is readily convertible to shovel, crane, or dragline service, include a booster-type drum and crowd clutches for easy operation; anti-friction bearings on all high-speed shafts; high line speeds on the drum; two travel speeds; a swinging speed of 5.15 rpm; a tail swing of only 9 feet, permitting work in close quarters; splined shafts, with all shafts independently removable; all friction clutch and brake surfaces of cast nickel iron; two-piece welded dipper sticks and all welded shovel boom; full manganese-steel three-piece dipper, with renewable lip and renewable and reversible tooth points; and independent chain crowd.

These and other features of the Model 375 American Gopher are described and illustrated in Bulletin 700-G-5-2, copies of which may be secured direct from the manufacturer or from this magazine.

One-Man Batcher For Bulk Cement

Two pieces of equipment for easy handling of bulk-cement batches are made by the Stevens Metal Products Co., Niles, Ohio. These consist of a Batch Barrel, a 16-gage steel container shaped like an oil drum, with a water-proof lid, and a Wheel-Batcher, a two-wheel pneumatic-tired cart for transporting the Batch Barrels around the cement dock.

The Batch Barrel, which has a maximum capacity of seven sacks, is 24⅛ inches in diameter and 39 inches high, is fitted with trunnions securely welded into depressions in the body of the barrel. The lid is equipped with two stationary clips and one spring clip to hold it to the rim of the barrel.

When the Batch Barrels have been loaded at the cement car, the Wheel-Batcher comes into action. It is equipped with two sets of handles, the lower set being used when wheeling the Batcher empty. In this position the weight of the frame is carried directly on the wheels, and the pick-up lugs are in a position to slip under the trunnions of the Batch Barrel. As soon as the lugs are under the trunnions, the operator pushes the frame of the Wheel-Batcher down until the swivel caster rests on the floor. This movement raises the barrel and swings it over the wheel axles so that the load is balanced, with the caster taking a small portion of the load for stability. A foot latch holds the Batch Barrel upright while it is being moved, but it will not turn over even when unlatched except when over the discharge chute.

The Stevens Wheel-Batcher and Batch Barrel for Handling Bulk Cement

The large pneumatic tires make it possible to handle heavy loads over rough or uneven floors and the three-point design provides for easy maneuvering in close quarters. The loaded Batch Barrel is set down by releasing the latch, raising the frame and backing the cart away. To dump the barrel, it is wheeled over a chute placed in the floor of the working platform. When a batch truck is in position under the chute, the barrel is unlatched and turned completely over, assuring a clean discharge. The loaded barrel is so evenly balanced on its trunnions that the operator can easily control the dumping action.

The manufacturer states that this Wheel-Batcher will handle 1,000-pound loads with ease. The wheels are equipped with roller bearings and Alemite lubrication. The Batch-Barrel, with the lid, weighs about 75 pounds and the Wheel-Batcher 210 pounds.

An illustrated pamphlet describing these pieces of bulk-cement handling equipment may be secured direct from the manufacturer by mentioning this item, or from CONTRACTORS AND ENGINEERS MONTHLY.

3½ E. D. LANSING TRAILER MIXER

This new Lansing Trailer Mixer is faster, more compact and easier handled. Its overall length is only 57" and entire width 68", with a height of 65".

It has a convenient shoveling height of only 42½", with a 31-inch drum. Sturdy 1⅞" axles and 26" wheels with pneumatic tires. Weighs only 950 lbs. Write or wire NOW for complete information.

LANSING COMPANY
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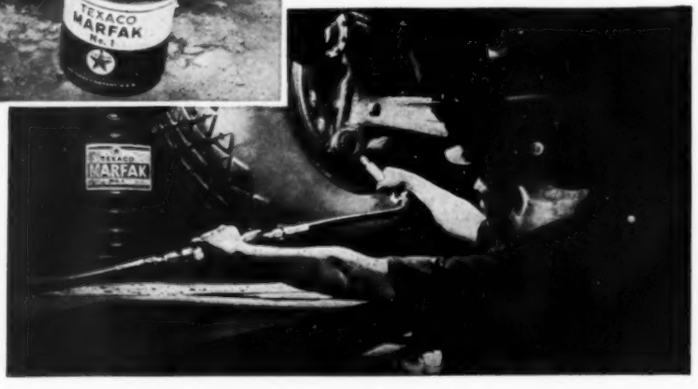
CHICAGO NEW YORK BOSTON PHILADELPHIA MINNEAPOLIS KANSAS CITY SAN FRANCISCO LOS ANGELES

WHERE ORDINARY GREASE *Won't do . . .*

Left • **SHOVELS, DRAGLINES, TRACTORS** present lubrication problems that Texaco Marfak will take care of properly. Marfak seals bearings against the effect of rain and mud, and the abrasive action of sand and grit.



Right • **TRUCK OPERATORS** get double service from Texaco Marfak for chassis lubrication. It protects parts twice as long. Doesn't separate or wash away.

MANY OPERATORS of heavy equipment know that it pays to service many important grease-lubricated bearings with Texaco Marfak.

Unlike buttery types of lubricants, Texaco Marfak is tough, adhesive, cohesive. It doesn't channel or squeeze out, but clings to bearing surfaces despite heavy pressures.

Texaco Marfak liquefies in the bearing, and retains its consistency at the ends, sealing in the lubricant and excluding dirt and water.

Experienced lubrication engineers, trained in the selection and application of Texaco Industrial Lubricants, will be glad to demonstrate that savings can be made with Texaco Perfected Lubrication.

For prompt engineering service and deliveries, phone the nearest of our 2279 warehouses in the U. S., or write:

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Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

TEXACO

TEXACO MARFAK

Iowa's Cornstalks, Nature's Snow Fence

But Modern Picking Machines Threaten This Aid to Counties, Edw. Hogeland Remarks at Waterloo

✦ THE IOWA cornstalk nearly 30 feet long that won the "Tall Corn" contest last summer is not half as valuable as the usual 6 to 8-foot cornstalks along Black Hawk County roads when it comes to furnishing a natural snow fence to keep drifts off the roads. When Edward Hogeland, County Engineer of Black Hawk County, said he had only 20 miles of snow fence for his 950 miles of county roads, we were astounded, but he pointed out that the cornstalks that had been hand-picked and left throughout the winter made the best possible natural snow fence. Since the method of planting is to use one field this year and then let it lie fallow the next, it is necessary for the county merely to shift its fence each year to cover the bad spot that is not taken care of by the cornstalks.

A modern invention seems likely to cost the county a pretty penny for more snow fence as the new machine corn pickers cut the stalks and leave none standing for their free winter service to the roads. Mr. Hogeland has instituted a campaign to enlist the aid of the farmers along the roads to pick the twenty rows next the road by hand and leave the stalks, and use the machines for the remainder of the great acreages of corn. In this manner the portion of the field that will be most effective in preventing drifting on the road will be left with the stalks standing and the farmer will still gain the economic advantage of low-cost harvesting of most of his crop. Then the snow will be trapped in the field 100 feet back from the fence, instead of increasing the cost of plowing and perhaps cutting off the farm from town for several days until the plows can get through the high drifts. It is good to report that the cooperation of farmers in leaving the cornstalks standing is increasing rapidly, greatly to the benefit of all.

In addition to this cooperative effort the county is trying all the time to grade its roads higher than the surrounding country. In doing this it places the grade of the road where the winds that can pile snow high in cuts will sweep the road clear of snow, leaving the road clear for traffic as soon as the storm has ended. In those places where the snow accumulates slightly because the road is at the same elevation as the surrounding country, the lighter and faster equipment can handle the clearing quickly.

Waterloo, the county seat for Black Hawk County, Iowa, is the center of a large commuting group working at the farm implement plants in the city. These people naturally expect that the roads will be open soon after a storm so that they may either get to work on time or return from work without delay. In 1935-1936 there was very heavy snowfall followed by about six weeks of subzero weather. During this time there was no thaw to bond the snow and every time there was any plowing done it filled in with the dry snow the same day, as the wind was constant. The county had twelve pieces of snow-plowing equipment scattered all over the county to handle this situation, as compared to an equal number of snow plows owned and operated by the State on about 75 miles of state highway in the county. Even this increased ratio was not enough to keep the state roads open, as they could not keep ahead of drifting.

Edward S. Hogeland, County Engineer, on the Right, and Raymond Stevenson, Assistant County Engineer, of Black Hawk County, Iowa, Snapped During Their Inspection of Some New County Equipment, Including Two Dempster-Dumpsters on Dodge Trucks

County Organization

The Highway Department of Black Hawk County, Iowa, is administered

(*Concluded on page 23*)

ANOTHER GOOD ROAD

Made by Good Engineering... Good Products

Socony Binder "C" Bituminous Penetration Macadam, Standard Brand, Park Avenue, Bridgeport, Conn.

SOCONY Asphalt Road Oils • Socony Asphalt Joint Fillers • Socony Waterproofing Asphalt • Socony Cut-Back Surfacing Asphalt • Socony Asphalt Binder A for surface treatment • Socony Refined Asphalt for sheet asphalt paving • Socony Cold Patch Asphalt for all types of patching • Socony Asphalt Binders B & C for penetration work (Asphalt Macadam) • Socony Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete) • Socony Asphalt Emulsions • Specifications and all other particulars furnished on request.

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Special Equipment
Movable Bridge Machinery
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Write for descriptive catalogs.
McKIERNAN-TERRY CORP.
19 Park Row, New York
Distributors in Principal Cities

A Rotor Wing Mounted on a Walter Snow Fighter

Snow Blade with Rotor Cuts Down High Banks

A new piece of rotary snow-removal equipment, consisting of a snow wing with a rotor mounted at the end, has been announced by Roto Wing Co., Mound, Minn. With the Roto Wing mounted at the side of a heavy truck, similarly to standard wings, the machine moves forward at 5 to 12 miles an hour, rolling the snow up the wing without compressing it. The snow is fed into the eye of the rotor at the end of the wing at this speed, and then the velocity is increased to 50 mph by the rotor without changing the direction of travel. The angular discharge is through an arc of 360 degrees.

With this equipment it is possible to widen the clearing to 10 feet beyond the ditch line. Also when snow has been piled up 5 feet high along the ditch line, the Roto Wing picks it up and discharges it into the fields. Full information, specifications and prices regarding this revolutionary piece of snow-handling equipment will be furnished to readers writing to Roto Wing Co., Mound, Minn. and mentioning this item.

Floating Resilient Highway Guard Rail

A feature of Empire highway guard rail, made by the General Wheelbarrow Co., 3140 E. 65th St., Cleveland, Ohio, is its full floating quality which the manufacturer claims makes for safety, efficiency and economy. This plate guard rail is designed for 16-foot post spacings, is so flexible that both vertical and horizontal curve alignment is provided for, has no complicated parts nor is any special erection tool required.

Cylindrical post springs hold the rail away from the posts, preventing collision with the posts on impact. A guide clip engages and supports the rail plate, and permits free longitudinal movement of the rail in either direction. The end springs maintain uniform tension throughout the fence, regardless of expansion or contraction caused by the weather, the manufacturer states. These springs automatically restore the fence to its natural position after impact.

Complete information on this Empire floating resilient plate highway guard rail, together with detailed instructions and diagrams for its erection, is contained in literature which interested state and county highway engineers may secure direct from the manufacturer.

One-Man Portable Concrete Breaker

A new type of demolition tool, with a number of patented features, has recently been announced by the Concrete Equipment Manufacturers, 80 East Jackson Blvd., Chicago, Ill., after 2 years of experimentation and exhaustive tests. This one-man portable concrete breaker is designed for use by state and county highway departments and by contractors for jobs too small to justify the expense of a large power plant.

The Modern Marvel breaker is made in three sizes of 65, 85 and 98 pounds, each size delivering approximately 1,000 blows a minute. The unit comprises a Wisconsin 4-hp gasoline air-cooled engine, with full releasing centrifugal clutch and speed regulator, or a standard electric motor, mounted on a swivel base, either power unit weighing 70 pounds. Power is transmitted through a Marvel-Wyco patented flexible drive shaft casing to which is attached an Arens patented throttle control giving the operator complete control of the machine at all times. One of the features of this unit is its positive locking device to hold the accessory tools.

A New One-Man Concrete Breaker

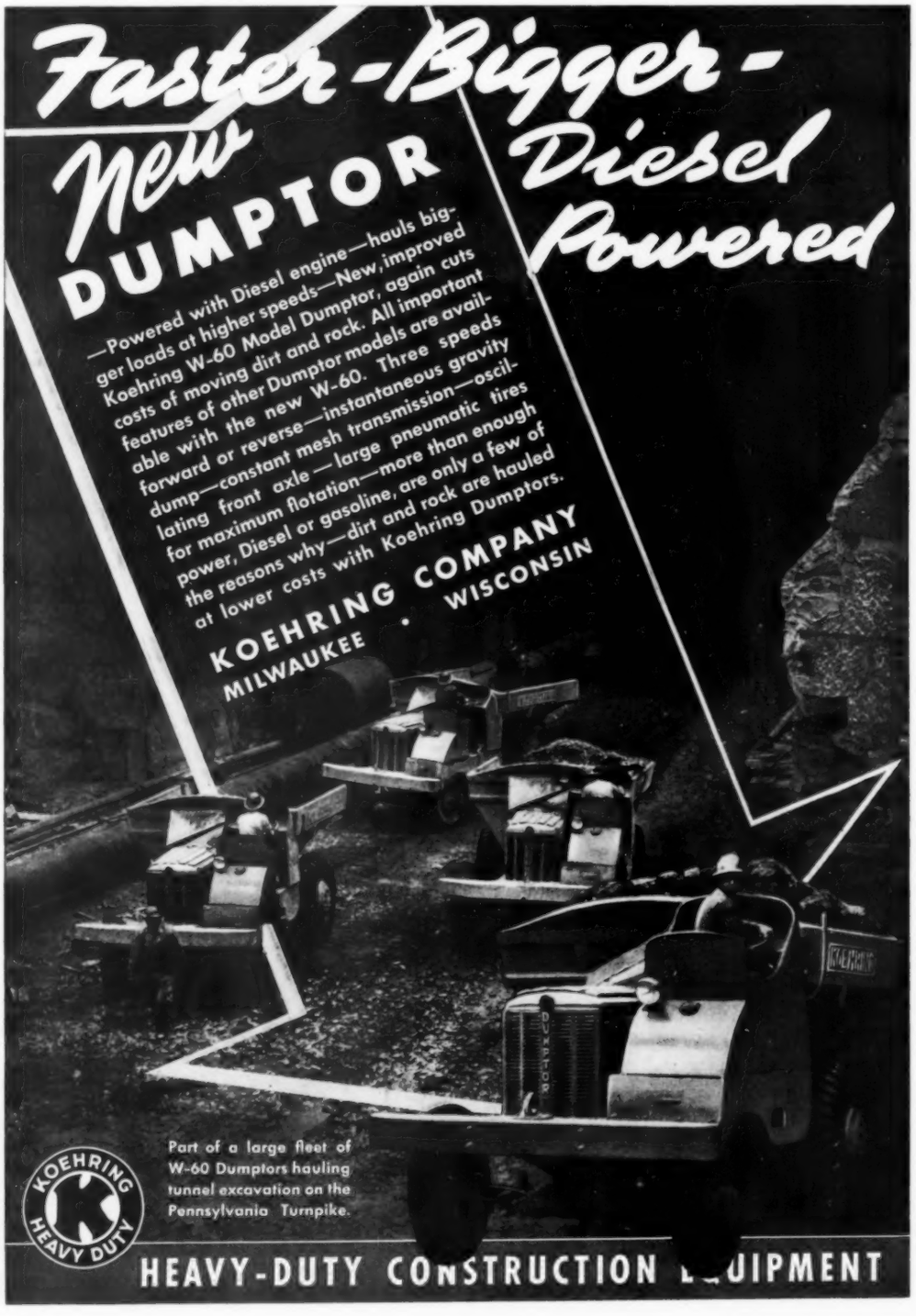
Complete information on the Modern Marvel concrete breaker may be secured direct from the manufacturer or from this magazine.

Handy Tools for Mechanics

The newest catalog of Snap-On Tools Corp., Kenosha, Wis., contains a complete illustrated listing of super-service sets for mechanics working on trucks and construction equipment, Master wrench sets, nut spinner handles, heavy-duty wrenches and all manner of helpful tools. This item is too short to list the complete assortment of tools described and illustrated in Catalog N, but readers of CONTRACTORS AND ENGINEERS MONTHLY may secure a copy free on request by mentioning this item.

CONCRETE VIBRATORS
(Gas and Electric)
Concrete Surfacing Attachments

Master Vibrator Company, Dayton, Ohio
DISTRIBUTORS IN ALL PRINCIPAL CITIES


Faster-Bigger-
New Diesel
Powered
DUMPTOR
—Powered with Diesel engine—hauls bigger loads at higher speeds—New, improved Koehring W-60 Model Dumptor, again cuts costs of moving dirt and rock. All important features of other Dumptor models are available with the new W-60. Three speeds forward or reverse—instantaneous gravity dump—constant mesh transmission—oscillating front axle—large pneumatic tires for maximum flotation—more than enough power, Diesel or gasoline, are only a few of the reasons why—dirt and rock are hauled at lower costs with Koehring Dumptors.
KOEHRING COMPANY
MILWAUKEE • WISCONSIN
Part of a large fleet of W-60 Dumptors hauling tunnel excavation on the Pennsylvania Turnpike.
KOEHRING HEAVY DUTY
HEAVY-DUTY CONSTRUCTION EQUIPMENT

12th Asphalt Conference Proceedings Available

The proceedings of the Twelfth National Asphalt Conference, held under the auspices of The Asphalt Institute, at Los Angeles, Calif., have been published by the Institute and may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY from The Asphalt Institute, 801 Second Ave., New York City. Price: $1.00.

The 256 pages of these *Proceedings* contain all of the papers presented at the various sessions on asphaltic materials, methods of design, and construction and equipment, as well as the discussions, both formal and informal.

Paving Brick Assn. to Meet

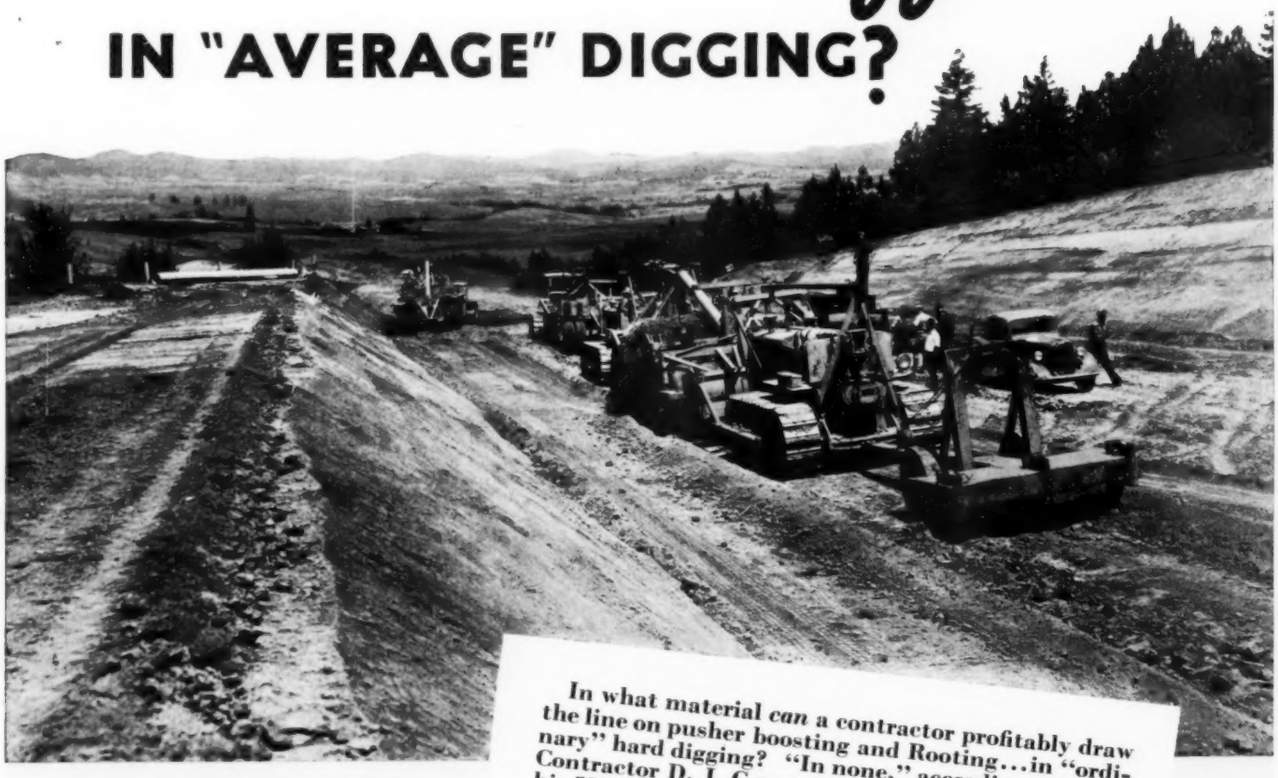
The National Paving Brick Association has announced that its 34th annual meeting will be held in Chicago, Ill., January 30 and 31, 1940, at the Congress Hotel, with the sessions on the second day open to the general public. It will be noted that this meeting is scheduled during the week of the 1940 Road Show-Convention of the American Road Builders' Association, January 29-February 2, and the many road builders who will be in Chicago are cordially invited to attend the open sessions.

The papers to be presented will include recent developments in manufacturing, in the technique of testing and in construction practices, particularly based on the experience with the additional mileage of vibrated monolithic brick pavement which has been completed during the past year. C. C. Blair, Metropolitan Paving Brick Co., Canton, Ohio, is President of the National Paving Brick Association, Washington, D. C.

Lubrication Problems Of the Modern Diesel

A very thorough analysis of the lubrication problems created by the modern diesel engine, now being used not only for stationary power but very extensively as the prime mover of construction equipment, is published in "Lubrication" Volume 25, No. 10. Copies of this analysis, of interest to all operating men, may be secured free on request by writing direct to The Texas Co., 135 East 42nd St., New York City, and mentioning this review.

WHY *Double Offense* IN "AVERAGE" DIGGING?



In what material *can* a contractor profitably draw the line on pusher boosting and Rooting...in "ordinary" hard digging? "In none," according to Idaho Contractor D. J. Cavanaugh's results. He's pushing his 580,000-yard road contract through rock and the easy stretches alike, near Moscow, Idaho . . . even though he knows his Carryall Scrapers can come through most any digging unaided.

But he knows, too, that there's up to 50% pay load increase to be gained by 'Dozer boosting extra-capacity Carryalls to the fullest possible pay load limit *with the same tractor horsepower* . . . with LeTourneau Rooter fragmentation "blasting" anywhere from 20% to 40% off ordinary loading time.

Think what that means to scheduled production! . . . then ask your LeTourneau and "Caterpillar" dealer to show you—with a demonstration—what Carryall Scrapers, 'Dozers and Rooters will do for *you*. You'll regret every minute you delay! R. G. LeTOURNEAU, INC., Peoria, Illinois; Stockton, California.

A LESSON IN PROFITS

Summary of Cavanaugh's LeTourneau equipment on the job:

6 Carryall Scrapers
4 Angledozers
1 Bulldozer
1 Rooter

= 1 *complete earth moving package*... to handle all jobs that come their way *at less cost-per-yard* than any other method can produce.

Standardize and specialize on LeTourneau ... you'll make money while you save money!

Keep Ahead of Scheduled Production

LETOURNEAU

CARRYALLS* 'DOZERS ROOTERS*

POWER CONTROL UNITS, DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, CRANES, TREE-DOZERS.

*Name Reg. U. S. Pat. Off.

Turnpike Tunnels Total 6.76 Miles

(*Continued from page 7*)

fact that there will be no speed limit on this road, no traffic lights, no grade crossings, and that the only interruptions to a maximum comfortable speed of a passenger vehicle will be the seven tunnels, the longest of which is Sideling Hill, 6,650 feet, which will be passed through in less than 2 minutes behind the slowest truck.

Statistics show that there are 16 miles of 0.5 per cent grade, 30.7 miles of 1 per cent, 12.9 miles of 2 per cent, and 40.5 miles of 3 per cent grade, leaving 29.59 miles of grades actually less than 0.5 per cent.

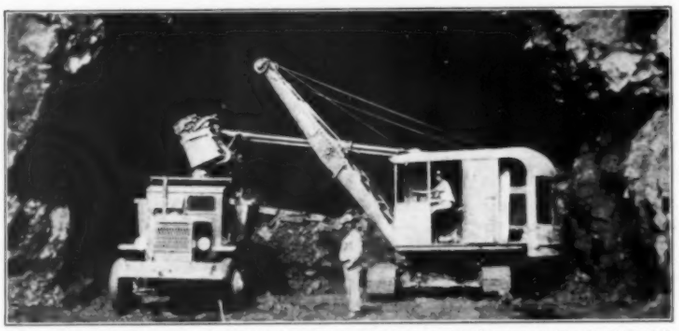
Tangents, Curves, Super-Elevation

There are 195 tangents totaling 108.8 miles in the 159.69 miles of the Turnpike and a total of 187 curves. These curves will not be annoying like those on existing roads over the Pennsylvania mountains. There are thirty-seven 1-degree curves totaling 15 miles, fifty-six 2-degree curves totaling 14.153 miles, fifty-one 3-degree curves totaling 12.076 miles, twenty-nine 4-degree curves totaling 6.019 miles, seven 5-degree curves totaling 1.808 miles and seven 6-degree curves totaling 1.424 miles, or 50.89 miles of curves. These figures on tangents and curves do not include the additional mileage for ramps, clover-leaves and the necessary side-road construction and relocation of transient roads. In addition to horizontal curves there are vertical curves over hills totaling 59.53 miles but all with long sight-distance, as is also provided by the long radius horizontal curves connecting tangents. These vertical curves permit a minimum sight-distance of 600 feet and are designed so that at night the headlights of approaching automobiles neither shoot into the air nor hit the pavement immediately in front of the car, but instead will illuminate the highway at a proper distance ahead to insure safe driving.

As with the case of curves, which are of long radius and with the dangerous sharp S-curve completely eliminated, the Commission's engineers have designed the super-elevation for all curves with safety in mind. Curves of 1 degree have a super-elevation of ⅛ inch per foot, 2-degree curves ⅜ inch per foot, 3-degree curves ¾ inch per foot, 4-degree curves 1 inch per foot, and 5 and 6-degree curves 1 3/16 inches per foot.

Concrete Aggregate and Mixes

Highway and structure concrete is divided into three types: Class A for thin and heavily reinforced sections in structures subject to heavy load or impact; Class B for heavy sections where there is a small amount of reinforcing such as the footings of heavy abutments of structures; and the third type for concrete paving. The water-cement ratio for these three classes of concrete, permitted by Turnpike specifications, are 6, 7 and 5½ gallons per bag of cement respectively. Internal vibration is used for all structure concrete which has an allowable slump of from 1 to 3 inches.



A Lorain 40 ¾-Yard Shovel, Used by the Arundel Corp. of Baltimore at the East Portal of Sideling Hill Tunnel on the Pennsylvania Turnpike

The concrete aggregate has been divided into three sizes for simplifying the specifications. These are referred to as: sand, which is all material passing a 4-mesh sieve; 1-inch stone, from 4-mesh to 1 inch; and 2-inch stone running from 1 to 2-inch screen size. For the concrete mixes the specifications call for 2B and 3A aggregate. 2B aggregate has 100 per cent passing a 1½-inch screen and from 0 to 10 per cent passing a 4-mesh screen. Aggregate designated as 3A has 100 per cent passing a 2½-inch screen and from 0 to 15 per cent passing a 1-inch screen.

The cement content of highway and structural concrete is as follows:

Class	Aggregate Size	Barrels of Cement per Cu. Yd. of Concrete
Class A	2-inch	1.49
Class A	1-inch	1.61
Class B	2-inch	1.27
Class B	1-inch	1.39
Paving	2-inch	1.56
Paving	1-inch	1.72

The Tunnels

There are seven tunnels on the Pennsylvania Turnpike project, totaling 6.76 miles in length. These tunnels were started by the South Penn Railroad builders and the work then accomplished represents about one-half of the tunneling necessary for the Turnpike. Two of the old tunnels have been abandoned and open cuts at higher elevations

(*Continued on next page*)

USE RIGHT BUCKET FOR THE JOB

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THE HAYWARD CO., 32-36 Dey St., New York

Hayward Buckets

"TERRIBLE TERRY" the Truck Driver

TERRY TRIES BEFORE HE BUYS

HOW'S CHANCES OF TRYING OUT THIS SUIT FOR A COUPLA DAYS? MAYBE I'D BUY IT!
ARE YOU CRAZY?
LOOK PROSPEROUS WITH A "CHECK" SUIT
I WANNA SAMPLE SOME OF YOUR JAVA BEFORE I BUY A CUP
GO AWAY!
YA CAN'T DUNK OUR SINKERS IN YOUR COFFEE
CAN I TRY OUT A FORD TRUCK BEFORE I BUY IT?
YOU BET, BUDDY. AN ON-THE-JOB TEST, WITH YOUR OWN LOADS, WILL PROVE IT'S THE TRUCK FOR YOU!

MAKE AN "ON-THE-JOB" TEST TODAY!

Ask any Ford dealer how you can arrange for a free demonstration — an actual "on-the-job" test designed to give you the *facts* on Ford performance and economy before you buy!

Before You Buy Any Truck or Commercial Car— See the Ford Line for 1940!

3 Engine Sizes — 95, 85, 60 hp ★ 6 Wheelbases ★ 42 Body and Chassis Types New Modern Styling ★ New Simplified Chassis Design ★ New Longitudinal Front Springs ★ Increased Engine Accessibility ★ Stronger Cab Construction ★ Increased Driver Comfort ★ New Sealed-Beam Headlamps ★ New Instrument Panels — *and a host of other new and time-proved features that make Ford Trucks and Commercial Cars for 1940 more than ever the outstanding units for the money!*

FORD TRUCKS AND COMMERCIAL CARS

Ford Motor Company, builders of Ford V-8 and Mercury Cars, Ford Trucks, Commercial Cars, Station Wagons, Transit Buses.

Turnpike Will Have Seven Major Tunnels

(Continued from preceding page)

used. At Laurel Hill tunnel, the most westerly, the east portal had caved in, so a new portal was built to the north and at a higher elevation in better rock. The seven tunnels are named for the mountains through which they carry the highway and they are, in order from east to west and with their lengths including east and west approaches: Blue Mountain and Kittatinny, totaling 12,400 feet in length; Tuscarora, 10,846.77 feet; Sideling Hill, 13,337.33 feet; Rays Hill, 7,008.27 feet; Allegheny Mountain, 9,816 feet; and Laurel Hill, 12,618.1 feet.

The excavation required for the 35,687 feet of tunnels, portal to portal, amounts to 763,070 cubic yards of rock, while the completion of the tunnels with their structural steel ribs, reinforcing bars and mesh, as well as concrete for lining and paving, will require 16,130 net tons of steel and 245,025 cubic yards of concrete, necessitating 501,350 barrels of cement, 104,340 cubic yards of sand, and 205,280 cubic yards of crushed stone.

Tunneling operations in all seven tunnels are being pushed with maximum speed by all contractors operating twenty-four hours a day. The most modern equipment, including both gantry and truck-mounted jumbos, are being used for stripping in the old South Penn operations, as well as driving the remaining full faces of the tunnels.

Geology and Design of Tunnels

Tunneling is through several limestone and shale foundations but sandstones predominate. In order to insure economical construction, the Commission employed geologists on a full-time basis to make preliminary exploration of the rock strata as well as to follow tunnel excavation throughout its progress. The locations of the tunnels had been selected with care by the earlier engineers through the narrow sections of the mountains and an endeavor was made to orient the tunnel perpendicular to the strike or slope of the strata of the rock, so as to use the structural strength of these strata to the best advanage. Most of the old railroad tunnels showed a remarkable state of preservation, unsupported as they were by timber, steel or masonry.

The tunnels are designed to carry a two-lane highway 23 feet wide between curbs and a 2-foot 10-inch sidewalk on one side. The clear width between the walls of the tunnel is uniformly 28 feet 6 inches and the clearance between the roadway and the ventilation duct, which is in the arched top, is 14 feet 4 inches. The side wall and the roof arch are a minimum thickness of 18 inches and the ceiling slab which forms the air duct between the arched roof and the roadway is of reinforced concrete 5 inches thick. In general, the tunnel walls and the roof are being poured against the native rock, but where this rock is not of a sufficiently stable character, steel and wood arch ribs are installed during construction, and where overbreakage occurs the open space outside of the ribs is being packed with hard stone or concrete behind hard oak lagging. This packing at the sides is completed before the wall concrete forms are set.

Heavy timber sets are used where ground conditions are unfavorable, supplemented by steel supports which act as reinforcing for the concrete lining, and in sections where acid water is encountered from coal seams the water is carefully removed by vitrified clay half-tile anchored to the rock and with an acid-resistant joint material. These tiles carry the water direct to the longitudinal drainage gallery beneath the roadway which is comprised of pre-cast concrete pipe. Further, lateral and longitudinal French drains are being installed where necessary to collect seepage and drainage water from beneath the roadway and carry it to the longitudinal drainage gallery.

In its studies of the waters from some of the coal deposits encountered in the tunnels, the Pennsylvania Turnpike Commission enlisted the cooperation of the Quality of Water Division of the U. S. Geological Survey. W. D. Collins, Chemist in Charge, worked with Milton Brummer, Engineer of Tunnel Design, and Dr. A. B. Cleaves, Geologist for the Commission, in these studies of acid waters and their effect on concrete.

The design of the tunnel approach tangents where the four-lane highway is reduced to a two-lane roadway is of interest, as it is planned to permit the merging of the high-speed and low-speed traffic in one direction with a minimum of disturbance. In general, a 1,000-foot tangent is used on the approach to each tunnel, but in a few cases it has been reduced to 800 feet because of location conditions. The left-hand lane, or fast lane, is continued straight into the tunnel and in the 1,000-foot approach tangent the right-hand, or slow, lane is tapered off. In this approach tangent the shoulder is paved with 8 inches of coarse aggregate base and a bituminous surface, as a safety measure. A low wall, which is curved, is brought out as a continuation of the tunnel wall and a curb is provided in it. This wall acts to prevent rocks from above the portal falling onto the roadway at the entrance to the tunnel and

(Continued on page 26)

Do you wish a really superior dumping unit for handling 2-cu. yd. Detachable Buckets?
SEE OUR MODEL LF
(Load Forward)
DEMPSTER DUMPSTER
For any 1½-ton truck
NO COUNTERWEIGHT OVERHANG SIDESWAY
All the load on the chassis.
DEMPSTER BROS. INC. Knoxville, Tenn.

For Those Who Want Extra Profits
The New and Improved
LINK-BELT "300" Shovel
SERIES

★ Built to Increase Output and Cut Your Operating Costs

TAKE those tough jobs . . . make them pay you full profit, every time! Versatility, Extra Power, Stamina enable this new LINK-BELT "300" series Shovel-Dragline-Crane to do more jobs . . . do them better, faster, and at lower cost. New speed—greater economy—many new and patented features are designed and built into these outstanding 1½-2 yd. machines.

Gruelling service in quarry work convincingly proves that these machines set new standards of performance and engineering perfection. Exclusive Speed-o-Matic control easily steps up output 25% or more.

Don't let old, expensive-to-operate equipment make profits a gamble. Modernize for extra dividends with a new LINK-BELT "300" series machine.

Improved Design Gives Greater Safety and Ease of Handling

Over 85 years of manufacturing and engineering experience enable Link-Belt Speeder to know your needs and produce machines to meet them. Every moving part in these new machines has been designed to incur an absolute minimum of wear or friction. Simplicity without sacrificing power or strength is their keynote.

By eliminating fatigue, the operator maintains the greater speed and capacity that has been designed and built into the "300" series machines. He retains the "feel" of the load at all times—thus assuring new accuracy; finer work. Double safety provision prevents dropping load due to mechanical failure at *any* point of control system.

Write today for Free Catalog giving full details on such new features as: ● *Higher Ground Clearance* ● *Longer Crawlers* ● *Faster Operating Speeds* ● *Better Weight Distribution* ● *Field-Proven Speed-o-Matic Control . . . and many others.*

Builders of the Most Complete Line of Shovels and Cranes
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Cedar Rapids, Ia.

Laying Traffic Lines On Rhode Island Roads

(*Continued from page* 1)

The painting unit consists of a 10-gallon tank with conical bottom mounted in the frame of a 3-wheel velocipede. The handlebars of the front wheel are extended to the back, so that the operator steers the machine as he pushes it from the back and keeps the extension indicator on the chalk line, or old paint line, which he is following.

The flow of paint from the tank is controlled by a valve which admits it to a perforated brass pipe applying the paint direct to the road surface. Behind this, a fibre broom the exact width of the line smooths the paint to an even width between a pair of copper plates which prevent splatter. The broom and guide plates are lifted quickly by a handle at the back. A tray on the handlebars is used to carry 15 or 20 sheet metal signs bent so that the "Keep Off" or "Wet Paint" lettering shows effectively as the operator drops the sign on the freshly painted line. These signs are placed at intervals of 10 to 20 feet. Between 50 and 75 of these signs are carried in the truck.

The Truck and Accessories

In addition to the signs and drums of paint and gasoline mentioned above, the truck carries a large mixing can in which the gasoline and paint are mixed in the proper proportions to permit it to run freely through the ¼-inch holes of the T-shaped applicator. The thinned paint is then poured into a larger can with a spigot chained at the back and with a strainer at the top to prevent unmixed material going through and eventually clogging the holes in the spreader head. The drum with the spigot is mounted on a step swung from the tailboard at just the right elevation so that there is the minimum lifting of the full can of paint which is used to fill the 10-gallon can on the machine.

Preparing for Painting

Where the old paint lines have completely worn off before it was possible to renew them, or where new lines are being applied, chalk marks are placed on the pavement and then a cord coated with blue chalk is snapped on the pavement, giving an ideal line for the operator to follow. In the case of repainting old lines, care is taken by the operator to follow the center of the 4 or 6-inch line. The truck driver picks up the signs after the paint has dried sufficiently to permit traffic to run over it, does the hand touching up at the end of broken lines and also brushes out the excess paint from the spreader brush when work is done so that there are not a lot of drops of paint "drooled" along the pavement as the machine is wheeled to the truck at noon or the end of the day.

This two-man unit paints from 3 to 5 miles of stripe per day and probably could do much more if it were not that the work is done in congested areas and with many breaks. The paint is prepared and dries completely in 30 minutes, when it is traffic-proof.

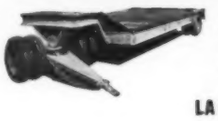
New Type of Tracing Paper For Engineering Drawings

A new type of tracing paper combining the transparency of oil-treated sheets with the permanence of 100 per cent rag papers has recently been announced by the Keuffel & Esser Co., Hoboken, N. J. This new paper, called Albanene, is made of 100 per cent long-fiber clean white rags, treated with a new synthetic solid called Albanite which was developed in the K & E laboratories. Because this new agent is free from oil and wax and is both chemically and physically inert, it is claimed that Albanene will not oxidize, turn yellow, become brittle or lose its transparency with age.

It is also claimed that the use of this new transparentizing agent permits a fine-toothed smooth drawing surface which takes strong pencil lines with a minimum of wear on the point. All lines are held by the fine hard tooth and do not become embedded in the paper structure, making erasures and corrections easy.

A new catalog describing and illustrating the three weights of Albanene, as well as a generous working sample of this new paper, may be secured by interested engineers and contractors direct from the manufacturer by mentioning this magazine.

LA CROSSE Heavy Duty TRAILERS



The most complete line on the market. Capacities, five to two hundred tons. Four to sixteen wheels. Two to eight axles. They are built to take the heaviest loads safely, and with the least damage to road beds. Write today. Just tell us what you have to move.

LA CROSSE TRAILER & EQUIPMENT CO., LA CROSSE, WIS., U. S. A.

DIVISION OF LA CROSSE BOILER CO.

THE LARGEST TRAILER IN THE WORLD IS A LA CROSSE !

LOOK OUT! WHEN YOU PLACE CONCRETE BELOW 50° FAHRENHEIT

Calcium Chloride used in concrete in Canton, Ohio, Stadium shown above

CONCRETE SLOWS UP IN COLD WEATHER

IT takes a standard portland cement concrete mix about 12 days to attain a flexural strength of 400 lbs. per square inch at 40° Fahrenheit, while the same mix at 70° reaches the same strength in less than four days. Even high early strength mixes placed at 40° take nearly eight days to acquire safe strength.

Yet, if calcium chloride is included in either standard portland or high early strength mixes, equal strengths are acquired in about half that time.

Calcium Chloride used in Canton, Ohio, Stadium

Just as Federal Housing projects have been pushed through the winter under specifications calling for calcium chloride in concrete poured below 50°, so also the builders of this fine Canton, Ohio, Stadium utilized calcium chloride to get acceleration of set and high early strength in cold weather.

No matter whether you make concrete blocks or build great structures, remember this—that the use of calcium chloride gets concrete out of danger quickly. It shortens the time when protective measures are needed. It increases workability and density. It reduces volume changes. Finally, it increases the ultimate strength by from 7 to 12%.

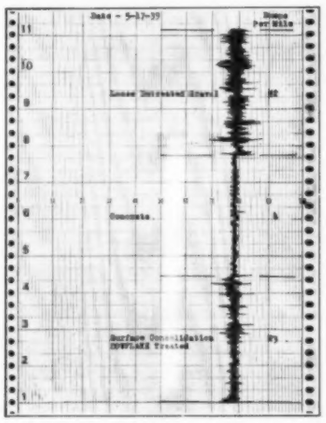
Write for latest research data and suggested methods of using calcium chloride in all cold weather concreting.

CALCIUM CHLORIDE ASSOCIATION

4145 PENOBSCOT BUILDING · DETROIT, MICHIGAN

CALCIUM CHLORIDE

YEAR 'ROUND CONCRETE CONSTRUCTION



A Rufometer Reading for Three Types of Road Surfaces Recorded at 40 Miles an Hour

New Device Records Roughness of Roads

A new instrument, known as the Rufometer and designed to register bumps per mile, has been designed and constructed by the Dow Chemical Co., Midland, Mich., for use by the Dowflake Road Research Department for measuring and recording the relative roughness of roads.

The fundamental principle of the Rufometer is the measurement of the vertical motion imparted to a vehicle body by the irregularities in the road surface. In the construction of the modern car, many of the undesirable irregularities of the road surface are absorbed in the car springs, and the car body assumes a vertical motion of long period relative to the road surface, while the wheels closely follow the actual contour of the road.

The Rufometer is mounted under the cowl at the right-hand side of the car and is easily accessible to driver or operator. Its essential parts are a linkage from the left front wheel to the instrument, a pen and pen arm, a numerical integrator, a chart and chart drive mechanism. Vertical motion of the wheel with respect to the car body is translated into oscillating motion of a shaft by means of a connecting link and arm. The motion of the shaft is in turn transmitted into motion of the pen arm by two cranks and a connecting link located under the cowl. The pen arm is about 6 inches long and carries a small standard fountain pen at its lower end. The pen point makes a movement either to the right or left of a neutral position, directly proportional to the displacement of the car body.

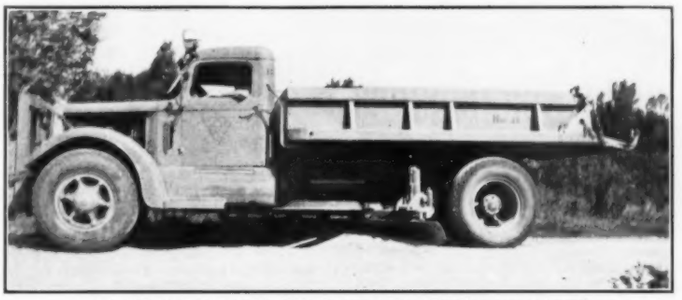
The numerical integrator consists of a small counter and an over-running clutch connected to the recording pen. This clutch is so constructed that it will drive the integrator in one direction proportional to the pen movement, thus integrating the movements of the pen, however small.

A strip chart, 6 inches wide, is used for the record and is driven through the recorder by a drive roll and gear train which is in turn driven by a power take-off from the speedometer cable. The chart has two optional speeds, ¼-inch per 0.1 mile or 2½ inches per mile, and ¼-inch per 0.01 mile or 25 inches per mile. Chart speed changes are accomplished by a gear shift in the gear train. The used chart is wound on a reroll at the lower part of the recorder which makes the charts easily accessible.

After the test, the charts are taken to the Laboratory where they are marked off in mile sections and the identification information and the number of bumps per mile recorded on the chart in their respective places. The charts may then be blue printed or enlarged for further study or reference.

New Truck Scraper

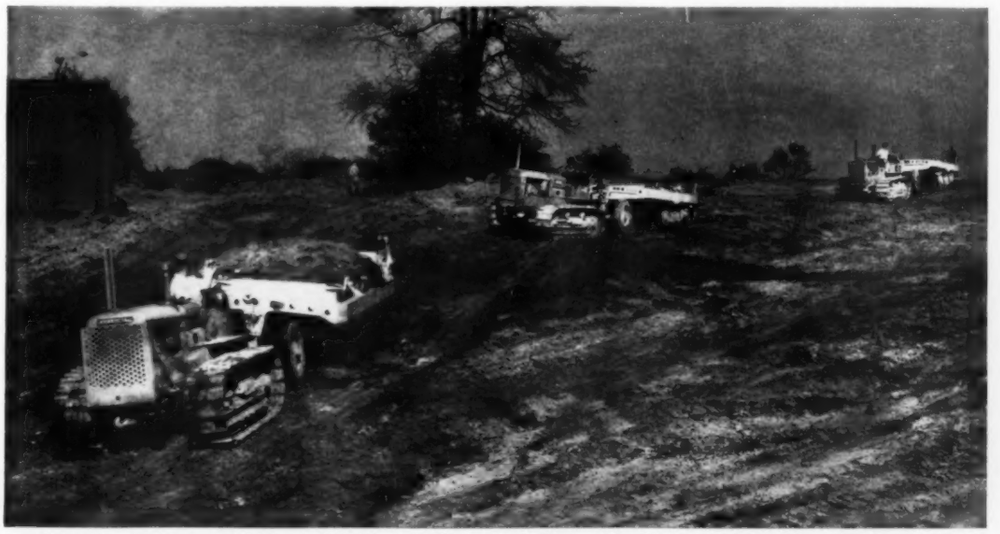
The new Model F-3 spring scraper, recently announced by the Root Spring Scraper Co., Kalamazoo, Mich., is designed for planing and leveling gravel roads, maintaining shoulders, and removing snow and ice. The unit is attached under any standard truck, and is operated from the truck driver's seat.



The Model F-3 Root Scraper for Year-Round Maintenance Work

Features of this new scraper include a full-height moldboard which makes it possible to cut down high spots; an adjustable spring cushion to meet the conditions on various types of road surfaces which require different spring tensions; and a transmission-operated hydraulic pump which generates four times the normal operating pressure for removing packed snow and ice. For planing and leveling road surfaces and in ice and snow removal work, the spring cushion is locked so that the blade is held rigid in any required position. As the wheels drop in any low place on the surface, the high spots are removed.

Complete information on the Root Model F-3 scraper may be secured by interested state and county highway engineers and contractors direct from the manufacturer by mentioning this item, or from this magazine.



A cubic yard a minute over a distance of 460 feet—that's the performance each of these three International TD-40 Diesel TracTracTors, pulling four-wheel scrapers, is turning in on this job.

Save Money All the Way Around with INTERNATIONAL Power

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Surface Treatment And Maintenance

Bases and Three Types of Surfacing Used by the State Highway Dept. of South Carolina

By W. K. BECKHAM, Maintenance Engineer, South Carolina State Highway Dept.

✦ SOUTH CAROLINA has about 3,000 miles of surface-treated road under maintenance and about 500 miles under construction, as well as approximately 500 miles of standard pavement with shoulders which have been surface treated in the past 3 years. Surface treatment in this state started in 1923 and the maintenance forces did all of this type of work until 1928, when the first contract for bituminous surfacing was awarded. Since then, most of the construction has been done by contract, but the maintenance forces do all retreatment work and continue to do some construction, including all experiments.

Base Construction

The surface treatments now used by the South Carolina Highway Department are of three types: first, double bituminous surfacing placed on selected soil bases; second, single bituminous treatment placed on stabilized bases; and third, mixed-in-place treatment which is placed on either type of base and is also used for retreatments of old surfacing. Probably as much as 90 per cent of the low-cost roads, newly constructed, consists of the double bituminous treatment on selected soil bases. The single treatment has been used generally for only one season. The percentage of mileage of the mixed-in-place type is low in new construction but, because this type is used in retreatment work, it makes up a high percentage of the total mileage.

Except in very few instances, all of these treatments are very thin and, of course, they cannot by themselves support even light loads. Therefore the serviceability of roads of this type depends more specifically on the base than it would in other types of construction. The soils used as bases for double bituminous surface treatment are generally of two types, sand clay and top soil. The quantity retained on a No. 10 sieve is not very important if the particles are not too large to prevent machining, but the material should contain at least 50 per cent coarse sand retained on a No. 60 sieve and not over 12 per cent clay. The liquid limit of the soil fines should not exceed 25, and the plasticity index should not exceed 10. Sufficient soil is placed on the road to give a minimum thickness of 8 inches when compacted, and a greater thickness is used where necessary.

The stabilized bases on which the single treatment is used consist of sandy soils stabilized with RC type cut-back asphalt, and sandy and clay soils stabilized with either portland cement or tar. The thickness of the stabilized base is varied from 4 to 6 inches, depending on traffic and subgrade.

Double Bituminous Surfacing

After the soil base is thoroughly compacted and conforms to the specified cross-section and grade lines, it is ready for treatment. All loose material and dust are removed by sweeping and blowing with a mechanical blower. Tar prime of the RT-2 grade is applied at the minimum rate of 0.3 gallon per square yard. A period of 2 to 6 days is usually required for the tar to dry and, during this time, the tar penetrates into the soil from ⅛ to ½ inch, depending on the density of the base.

Hot asphalt, having a penetration of 150-200, is then applied at a minimum rate of 0.4 gallon per square yard, and this material is covered while it is still hot with aggregate graded from 1¼ to ½ inch. The minimum quantity of aggregate which will just cover the area uniformly is used, usually approximately 48 pounds per square yard. The aggregate is spread from mechanical spreaders attached to the truck bodies, but it is usually necessary to "spot up" bare places by hand. The aggregate is rolled as soon as possible with a 5-ton tandem roller, or a pneumatic-tired roller. Although the tandem roller crushes some of the aggregate, it also appears to seat the aggregate in the asphalt more thoroughly than the pneumatic-tired roller.

The seal is usually applied within a week after the coarse aggregate. The mat is cleaned by sweeping and blowing, and a tack coat of approximately 0.17 gallon per square yard of RC-type liquid asphalt is applied. Fine aggregate, graded from ½ inch to No. 16 sieve, is applied at the rate of 18 pounds per square yard by the same mechanical spreaders used for the coarse aggregate. The material is swept into place so that the aggregate is uniformly distributed. It is then rolled with a 5-ton tandem roller and allowed to air dry. Cut-back asphalt is applied on the surface at the rate of approximately 0.23 gallon per square yard. It usually requires from 2 to 6 days for the cut-back asphalt used in the seal to cure. During this time, the seal is rolled at least once. This penetration seal is used in order to complete the road for traffic as early as possible. Formerly, a drag seal in which the seal stone and cut-back asphalt were mixed by non-revolving broom drags was used. This seal was applied after the coarse aggregate had been under traffic for several weeks. Although this method produced an excellent coating of the aggregate, it proved expensive, as it required the contractor to bring equipment to the job twice.

Single Bituminous Surfacing

A tar prime is required for a single treatment when the base consists of a cement-stabilized soil. When the soil has been stabilized with bituminous materials, a prime coat is unnecessary. The base in all these instances, however, must be carefully cleaned of loose material and dust before the application of hot asphalt. The hot asphalt having a penetration of 150-200 is applied at a minimum rate of 0.35 gallon per square yard. While this material is still hot, it is covered with aggregate graded between ¾ and ¼-inch screens. The minimum quantity which will secure a cover is used, approximately 30 pounds per square yard being required. The spreading and rolling of this material are performed in the same manner as described for coarse aggregate in the double treatment. The road can be opened to traffic immediately after rolling is completed.

Mixed-in-Place Treatment

If the mixed-in-place treatment is to be applied on a selected soil or a

(Concluded on page 33)

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P&H First to turn to all welded construction which eliminates hundreds of rivets and bolts—saves many repair bills and costly delays.

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P&H First to adopt true tractor type crawler construction—a proved money saver on thousands of jobs.

P&H First to give you the convenience and economy of replaceable, low cost crawler shoes — removed without disturbing the crawler belt.

A New Single-Drum Rear Cable Control

The new Caterpillar single-drum rear-mounted cable control for use on Caterpillar crawler tractors is a compact unit, the features of which are convenience and accuracy of operation, according to the manufacturer. The control lever, located at the forward right-hand side of the operator, permits full attention to the work from the most natural and comfortable position. With the lever in center position, the drum is locked in neutral; drawn in toward the operator, the drum reels in cable; and moved away from the operator, the drum allows the cable to unreel. Attachment or removal of the unit is quick and easy, and all adjustments are external and easily accessible.

A new folder, describing and illustrating this new cable control unit for the control of bulldozers, trailbuilders and similar single-cable-operated equipment, may be secured direct from the Caterpillar Tractor Co., Peoria, Ill.

A D7 Tractor Equipped with a LaPlant-Choate Bulldozer and the New Single-Drum Cable Control Unit Leveling Off a Road Cut Near Morton, Ill.

Spreaders for Ice Control

The Burch Model TS sand spreader, made by The Burch Corp., Crestline, Ohio, is a light and efficient machine built to handle all types of material used in ice control. Mounted on two rubber-tired wheels, it is a centrifugal machine, the power for driving the distribution disc or spinner being provided by the two wheels traveling on the road surface and transmitted through a set of bevel gears. It takes the material from a door or chute in the rear end-gate of the truck with the truck body elevated, or material can be shoveled into the hopper of the spreader if the truck body is not equipped with a hoist.

Complete information on these spreaders is contained in an illustrated Bulletin SAS No. 3, copies of which may be secured direct from the manufacturer by mentioning this magazine.

New Ransome Dealer

Announcement has been made by the Ransome Concrete Machinery Co., Dunellen, N. J., of the appointment of the Gopher Equipment & Supply Co., 1108 Second Ave., So., Minneapolis, Minn., as distributor for the complete line of Ransome concrete mixers, pavers and truck mixers in all but a few counties in Minnesota and Wisconsin.

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P&H is still five years ahead of the field.

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EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

New High-Line Bridge For Southern Pacific RR

(*Continued from page 2*)

have 18-foot centers. The steel brings the height of the bridge up to approximately 92 feet above mean water level. The heaviest piece erected, four panels of bottom chord, was 17 tons. The completed weight per span is 317 tons.

The method of erection was to drive six 110-pound steel piles for each of the three standard falsework bents per span. This was done progressively, using materials over as the work proceeded. The bulk of the lifting was done by an American Bridge Co. locomotive crane with 150-ton vertical lift and an extra heavy 85-foot boom. This was helped out in the case of the pairs of 80-foot 26-ton girders located at each end of the river span by a 30-ton Manitowoc crawler Speedcrane.

There is a viaduct approach to the south end of the bridge and a longer curved and straightaway one to the north. The north viaduct member has 26 towers and the south 8 towers. The former vary from 69 to 83 feet in height and the latter from 10 to 64 feet. There are also two short towers at the north end carrying spans to land on concrete abutments meeting grade, which is a cut at that point.

Typical towers rest on four concrete pedestals, each tower being 35 feet long, parallel to the track, widths varying with the height from 11 feet to 42 feet 1 inch. A large part of the erection work here was done with the crawler crane. The tower span girders, however, which are 70 feet long on the curve and 75 feet 5 inches on the straightaway, were placed by means of the large crane in conjunction with the Speedcrane. These girders came assembled, weighing approximately 15 tons each and are 7 feet 6 inches and 8 feet in depth.

Besides the locomotive and crawler cranes mentioned, the contractor had a 60-ton Bay City locomotive crane in the yard, situated near the approach to the south end. Compressed air was furnished by an Ingersoll-Rand diesel 315-cfm compressor, while Chicago Pneumatic and Ingersoll-Rand riveters and impact wrenches were used.

Personnel

The American Bridge Co. was represented by Edward Nimmergood, Superintendent of Erection, who erected the cantilever on the Oakland side of the San Francisco Bay Bridge. William G. Beckerley was Field Engineer and George Faulkner, Assistant Field Engineer. The bridge is being built by the Bureau of Reclamation in the Central Valley Project, Walker R. Young, Supervising Engineer, Sacramento, Calif.

Safety Equipment Catalog

American Optical Co., Southbridge, Mass., has issued recently a new industrial safety-equipment catalog describing in detail its complete line of eye, head and lung protective equipment and also its new line of safety clothing providing protection from head to ankles. According to the manufacturer, this catalog is the most complete ever issued and can be considered an authoritative treatise on safety problems in industry and their solution.

Among the items described are goggles for protection against impact, glare, splashes of liquids, and particles of dust; welding helmets, face shields and respirators; and safety gloves, suits, sleevelets, leggings, aprons, hats and hoods. Copies of this booklet may be obtained without charge direct from the manufacturer by mentioning this magazine.

Pontoons Cast in Dock Floated to Bridge Site

(*Continued from page 8*)

Washington Bridge Project, which is one of the largest ever undertaken by a state highway department, is to study the aerial view shown on page 8. This shows the roadway starting at Rainier Avenue, ducking through the tunnel under the ridge just before coming to the Lake, then the long pontoon structure with steel approaches at each end, the Toll Plaza on Mercer Island, the roadway across the Island, the bridge over the East Channel and, in the dim distance, Mercer Slough crossed by a viaduct.

The various section contracts are numbered from 1 to 11, starting at the Seattle end, as follows:

Section No. 1 starts at Rainier Avenue and Atlantic Street and extends to the east end of 27th Avenue Overcrossing, a distance of approximately 2,400 feet. It includes grading and paving and the construction of one overcrossing, one undercrossing, and one pedestrian undercrossing. The Northwest Construction Co., Seattle, is the contractor and the bid price was $357,009.

Section No. 2 is a twin-bore concrete-lined 4-lane tunnel, 1,445 feet long, passing under what is known as Mt. Baker Ridge. The two bores will run side by side, with a minimum vertical clearance 14 feet 6 inches. Each will have a 24-foot roadway and a 3-foot pedestrian walk and each will carry traffic one way only, in two lanes. The contractor is Bates & Rogers, Chicago; the bid price, $1,422,737.

Section No. 3 is the approach to west end of pontoon bridge and consists of a steel and concrete viaduct-type bridge 1,062 feet long. It will carry a 4-lane 45-foot roadway and two 4-foot sidewalks. General Construction Co. and Columbia Construction Co. are the joint contractors, the bid price being $460,-470.

Section No. 4 is the pontoon bridge of reinforced concrete sections, with a total length of 6,561 feet, to carry a 45-foot, 4-lane roadway and two 4-foot sidewalks. The joint contractors are the Puget Sound Bridge & Dredging Co., Parker-Schramm Co., and J. H. Pomeroy & Co. The bid price was $3,253,597.

Section No. 5 is the approach to the east end of pontoon bridge, similar in construction to Section No. 3, and is 960 feet in length. The contractor is the Puget Construction Co., which bid $465,-147.

Section No. 6 consists of the grading and concrete paving of the highway on Mercer Island, 6,773 feet long, with two 20-foot roadways and a 4-foot separation strip. Fiorito Bros., Inc., (Joe Fiorito) is the contractor and the bid price was $265,742.

Section No. 7 is the grade separation on Mercer Island, including three reinforced concrete structures, together with frame toll house and administration building. The contractor is the Dally Construction Co., Seattle, which bid $275,195.

Section No. 8, grading and paving 7,741 feet of 4-lane concrete road on Mercer Island was awarded to N. Fiorito, Inc., on the bid price of $253,151.

Section No. 9 is the structural-steel and reinforced-concrete bridge to carry a 4-lane 45-foot roadway and two 4-foot sidewalks across the East Channel of Lake Washington, having a fixed span of 215 feet, a 39-foot clearance, and a total length of 1,355 feet. The Puget Construction Co. is the contractor; the bid price, $527,010.

Section No. 10, paving and grading 2,086 feet of 4-lane concrete pavement with a 4-foot dividing strip eastward from Channel Bridge, was awarded to N. Fiorito, Inc., on a bid price of $92,836.

The Assembly of Pontoon Cell Forms in the Graving Dock

Section No. 11 is a bridge, 2,522 feet long, a reinforced-concrete structure of the viaduct type spanning Mercer Slough. It will carry four traffic lanes on a 45-foot roadway. The contractor is Rumsey & Co. of Seattle, and the bid price was $609,175.

The Pontoon Bridge

The most interesting feature of the whole project is the concrete pontoon bridge with its sliding draw section. There are ten typical sections and several special sections entering into the pontoon, all to be rigidly bolted together. The typical straight-away sections, of cellular structure, are 350 feet long, 59 feet wide, and 14 feet deep, and they will draw about 7 feet of water. Each section is divided by longitudinal and transverse concrete walls into cells approximately 14 feet square. At the transition points, the cells are so constructed that it is possible to control flotation by flooding or pumping out certain cells. This is necessary to compensate for changes in lake level, the normal maximum to minimum change being about 3 feet.

All sections are anchored transversely each way from the center with one anchor on each side. Around the navigation span there are additional transverse anchors. When all sections are in place, they will carry the road bed at approximately 7 feet above the surface of the lake.

The draw section is 378 feet long and slides back and forth in a recessed waterway 202 feet long, being manipulated with cables and drums. The roadways are carried on each side of the waterway. The navigation channel is between the two fenders and the draw operates like the sliding member of a huge slide rule.

The pontoon sections are being cast in specially constructed graving docks and are to be floated one by one to the location. The photograph above shows an assembly of pontoon cell forms in the graving dock.

Other Phases of the Work

Construction work was actively under way at several points on the project in April of this year. Pontoon sections were being cast at the graving docks. The bridge across East Channel was well into the preliminary stages.

At the west end of the pontoon bridge location, pile driving had been begun by the General Construction Co. and Columbia Construction Co., preliminary to the erection of the steel approach spans at that point.

Nearby, excavation had just started for the east portal of the twin-bore tunnel. This excavation, some 50,000 cubic yards, is a subcontract to L. J. Dowell, Inc., of Seattle. He was rapidly paring down the steep hillside with two Koehring ¾-yard diesel shovels loading to trucks for a short haul down the hill to the bridge approach.

If you have any special lubrication problems, write the Editor. He will be glad to help you.

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MODEL EA11 — 20-TON HAND JACK — Built for heavi-lift work yet weighs only 48½ lbs. Hydraulic lift, 6½", total height, 17½". Users net, only $35.00. (Slightly higher in West and Canada).

Write for data on Blackhawk products as applied in general and special construction and engineering work.

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The Schrader Spark-Plug Tire Pump

Compact Tire Pump For Use in Field

A new, practical type of tire pump which does not involve space-consuming equipment on the grease truck has been developed by A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn, N.Y. The Schrader spark-plug tire pump furnishes clean, cool, compressed air up to 75 pounds pressure. A spark plug is removed and the pump is screwed into the spark-plug opening. The opposite end of the hose is equipped with a pump connection which screws onto the valve cap thread of the tire valve. The engine is then started and run at an idling speed. On the down stroke of the piston, air is sucked through the top of the pump and as the piston starts its upward stroke a check valve in the pump closes and forces the air through the hose into the tire.

The inflation rate depends on the type of engine and speed of operation; therefore it cannot be given a definite figure. However, the Schrader No. 8888 spark-plug pump will generally inflate a 6:00 x 16 tire from 0 to 30 pounds in two minutes and from 20 to 30 pounds in one-half minute. Similarly it will inflate a 9:75 x 22 tire from 0 to 30 pounds in about five minutes and from 20 to 30 pounds in about two minutes.

Complete information regarding this new tire service unit will be furnished by the manufacturer free on request to those mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New D-C Welders

A new direct-current 150-ampere arc welder has been announced by the General Electric Co., Schenectady, N. Y. This new unit, which requires less than 2½ square feet of floor space, has a rated output of 150 amperes at 25 volts, a range of adjustment of 20 to 200 amperes at 25 volts, and operates on 220 or 440 volts, 2 or 3-phase, 60 cycles.

Any welding current within the wide range of this welder is quickly and easily obtained by means of a simple three-point selector switch and an easily operated dial for intermediate adjustment. Additional assurance of dependable operation for continuous use is provided by reliable self excitation. Isothermic overload protection permits the welder to carry maximum safe overloads without danger of burnout and without unnecessary interruption on harmless overloads.

The features and performance of this new welding unit are described in Bulletin GEA-3081B, copies of which may be secured direct from the manufacturer or from this magazine.

Long-Span Joists For Garage Roofs

Of interest to state and county highway departments contemplating the construction of department garages and maintenance depots, where economy of construction and maximum free space are of importance, is the long-span joists made by the Bethlehem Steel Co., Bethlehem, Penna.

The use of these long-span joists made it possible to eliminate all but one intermediary supporting column for the roof construction of a garage in Great Neck, Long Island. The overall dimensions of the building are 120 x 160 feet, with a space 100 x 120 feet devoted to the garage proper. The spans in the garage space are 60 feet in length. As contrasted to standard construction with intermediary supporting pillars an important saving in steel tonnage was effected, and contrasted with trussed construction, both fabricating and erection costs were reduced.

The joists are wall bearing, thus dispensing with the need for wall columns, and facilitating the convenient location of windows to afford the proper light for the work to be carried on within the building.

Long-Span Joists Used in the Roof Construction of This Garage in Great Neck, L. I., Provide the Maximum Amount of Free Floor Space

COMPACT—POWERFUL—SAFE
"For use where power is not practical or available"
Manufactured in 2, 5 and 15-Ton Sizes. For capacity comparison, ½" cable used:
2-Ton "Lightweight" ..... 75 ft.
5-Ton "General Utility" ..... 250 ft.
15-Ton Triple-Geared "Special" ..... 1200 ft.
Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price, f.o.b. Seattle
2-Ton 4, & 22 to 1	80 lb.	$ 50
5-Ton 4, & 24 to 1	110 lb.	$ 75
15-Ton 4, 19 & 109 to 1	680 lb.	$250

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WALTER SNOW FIGHTERS plow through the heaviest drifts with a driving, smashing force that is amazing to those who are familiar with rear-wheel and ordinary four-wheel drives only. Walter *Four-Point Positive Drive* provides such extraordinary traction and great available power as to have the complete confidence of road officials, bus companies and others in the "snow belt" where the problem of keeping roads cleared in mid-winter is a tremendously difficult one.

Ask us about Walter Automatic Lock Differentials . . . Suspended Double Reduction Drive . . . Ten-to-One Range Transmission . . . Exceptionally Powerful Heavy Duty Braking System, and other distinctive features that put Walter Snow Fighters in a class by themselves.

Mister, it's your move NOW.

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A Speed Dumper Hand-Loaded with Trench Excavation

Detachable Buckets For Hauling, Dumping

The Speed Dumper, manufactured by the Good Roads Machinery Corp., Kennett Square, Penna., is a piece of equipment intended primarily for loading, hauling and dumping materials at low cost. It consists of a gantry frame and reversible worm-and-gear driven cable hoist which can be installed on a standard truck chassis, and a series of five steel buckets.

Arriving on the job with the nest of buckets carried on the gantry, the Speed Dumper places the buckets separately at points where material is to be removed. The waist-high buckets are then loaded by hand, and as each bucket is filled the truck picks it up, carries it to the desired location, dumps the material, returns the bucket to the loading point, and then goes on to the next loaded bucket. The manufacturer states that the Speed Dumper can lower buckets to a point more than 20 feet below grade and can pick up loaded buckets from the same position.

One drum of the hoist can be easily disengaged and the remaining single cable can then be used for a variety of special purposes, such as pulling up small buckets through manholes. The hoist and gantry can be used for lifting and carrying other materials, such as pipe, timber, or reinforcing steel. The hoisting unit is claimed by the manufacturer to be absolutely dependable and is provided with a self-actuating brake. The truck driver has complete control of the unit at all times.

A new four-page folder, containing a complete description and specifications of the Speed Dumper as well as a number of job photos showing the various uses to which this piece of equipment may be put, may be secured by interested contractors and state and county engineers from the manufacturer.

Dial Batch Scales

The use of a springless dial scale at an asphalt or concrete plant greatly increases the accuracy of the weighing operation as the operator knows at all times just how much material is in the batcher and just when the rate of flow of material from bin to batcher should be cut down and then shut off.

The Kron springless dial scales, with manual, semi-automatic or fully automatic control, and designed for weighing cement, aggregates for concrete or asphaltic mixes, and asphalt, are so made that if a batch does not completely discharge from the weigh hopper, this fact is automatically registered on the dial.

The Kron Co., Bridgeport, Conn., manufacturer of these scales, suggests that greater speed in the batching operation can be secured by following this procedure. Open the bin gate wide and then gradually close the gate as the pointer nears the indicator on the rim of the dial scale. If the sand gate is being operated, the gate should be closed at the first indicator which is set at the sand batch weight. The gate should be closed at the second indicator if the stone compartment is loaded first as that indicator is set at the stone batch weight. Then the other gate is opened and closed gradually as the pointer nears the third indicator which is placed at the total weight of the batch. When the entire batch is discharged, the pointer returns to zero.

Kron scales have been used in the batching plants of a number of outstanding construction projects, including Boulder Dam, where 38 scales worked night and day over a period of several years handling the aggregate and cement which made up the 8,000,000 tons of concrete for the dam; Grand Coulee Dam, where 22 scales were used; Norris Dam, Wheeler Dam, Bonneville Dam, Pickwick Landing Dam, San Francisco Bay Bridge and the Dos Bocas Dam in Puerto Rico.

Complete information on these scales for all types and sizes of batching plants, large and small, is contained in literature which may be secured direct from the manufacturer or from this magazine.

Proving Grounds Started For International Trucks

The construction of a modern proving grounds for the testing of motor trucks has recently been started by International Harvester Co., Chicago, Ill., on a tract of land southeast of Fort Wayne, Ind. The program consists of extensive modernization and expansion of the grounds which the company has maintained in Fort Wayne for some years.

The new track, being built by Indiana Engineering & Construction Co. of Fort Wayne, Ind., is 6,200 feet long and consists of an oval-shaped concrete pavement corresponding to standard highway pavements in the United States. Two straightaways will be paved 25 feet wide while the banked turns will be 35 feet wide. Three turning circles will be located around the track, inside the oval, as well as two steering courses. Extending nearly halfway around the concrete pavement, and located just inside, will be a stretch of highway paved with Belgian blocks, to afford an opportunity to test trucks on rough pavements similar to those often encountered in large cities, and especially in the older European cities.

A mud, water, and sand bath will be built as a section of the concrete road, to furnish difficult hazards for the trucks to meet at various speeds.

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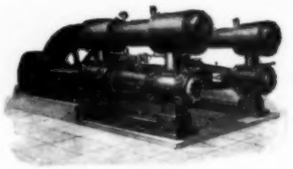
George Schlesinger Dies in Washington

George F. Schlesinger, Chief Engineer and Secretary, National Paving Brick Association, Washington, D. C., died suddenly at his home in Washington on December 1.

Born in Xenia, Ohio, in 1884, Mr. Schlesinger was graduated from Ohio State University in civil engineering in 1907, and then practiced civil engineering, principally railroad work, until 1915. Between 1919 and 1925 he was Division Engineer and later Chief Engineer of the Ohio Department of Highways. From 1925 to 1928, when he became associated with the National Paving Brick Assn., he was Director of the Ohio Department of Highways and Public Works.

Since September, 1938, he had also been Treasurer of the American Road Builders' Association.

Members of the highway industry will find that all roads lead to Chicago next month for the A.R.B.A. Convention and Road Show to be held there Jan. 29-Feb. 2, and the Annual Meeting of the National Paving Brick Assn. Jan. 30-31.



The New Class O-CTE Compressor Made by Chicago Pneumatic Tool Co.

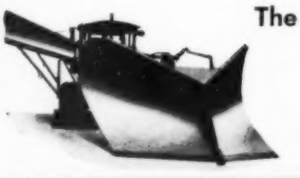
New Compressor Bulletin

C-P Class O-CTE horizontal tandem duplex motor-driven compressors are described and illustrated in a new bulletin issued by the Chicago Pneumatic Tool Co., 6 East 44th St., New York City. These units are identical with the Class O-CE compressors, except that each side is provided with low-pressure and high-pressure cylinders in tandem.

Copies of Supplement B to Bulletin No. 726, containing a description of these units and a number of illustrations showing them in a variety of services, may be secured direct from the manufacturer or from CONTRACTORS AND ENGINEERS MONTHLY.

COLUMBIA A. C. GENERATORS
SIZES: 1 to 300 KVA.
SPEEDS: 1800, 1200, 900, 720, 600, 514, 450 R.P.M.
SHIPMENT: ONE WEEK TO 10 DAYS.
62.5 KVA .8 power factor, 240 volt, 3 phase, 60 cycle, 1200 R. P. M. Columbia revolving field type A. C. Generator with direct connected exciter.
Driven by Diesel or gas engine, Columbia Generators furnish power and light where current is not available and are also used for stand-by service in event of power failure. Compactly built, they are easily portable. Write for bulletin describing their dependable construction.
COLUMBIA ELECTRIC MFG. CO. 4510 Hamilton Ave., Cleveland, Ohio

EFFECTIVE BLADING OPERATIONS
More than a maintenance machine, the Galion heavy duty motor patrol has full reversible blade which permits adjustments to every angle . . . for flat bottom ditching . . . for trimming shoulders . . . for bank cutting . . . for working when necessary in reverse gear.
Motor patrols
Pull graders
Rollers
Spreaders
Sanders
Rooters
In this one unit Galion offers a service range capable of meeting any grader requirement . . . and only one man needed to do the work. Many other features contribute to its genuine usefulness and low-cost operation. Send for engineering details.
The Galion Iron Works & Mfg. Co.
Main Office and Works: Galion, Ohio
Export Division: Columbus, Ohio



Equipped with a Galion snow plow the HEAVY DUTY motor patrol will effectively combat snow blockades this winter. It is an ideal combination and should enter in your winter campaign.

Highway Maintenance In Black Hawk County

(*Continued from page* 11)

by a County Board of Supervisors elected for three-year terms, there being seven on the Board. The members are elected in November and take office in January, with the elections staggered so that the entire board is not elected in one year. Each supervisor is elected from a district and is responsible for the maintenance of the county roads in that district. The County Engineer is appointed for a term of one year, although the state law permits an appointment for three years. The present incumbent has been in office for three 1-year terms.

Finances

The income for the use of the county highway department is derived from money returned to the counties by the state from the state gas tax, from the motor carrier tax and from a county tax levy for roads. Of the gas tax a stipulated per cent is retained by the state and then the balance is returned to the counties on the basis of motor vehicle registration, population and road mileage. In 1938 Black Hawk County received about $58,000 from this source, and anticipates an equal sum in 1939. The motor carrier weight tax netted about $8,500 to the county for maintenance in 1938, while the county levy, also for maintenance, amounted to $122,000. A total of $135,000 was available for maintenance in 1939.

Mr. Hogeland is a firm believer in an engineering-business administration for a county highway department, buying equipment as the need arises and for cash, without issuing warrants with interest against future taxes for equipment that may be worn out by the time the last payment is made on it.

County Garages Scattered

The county equipment is scattered throughout the county, there being a total of twelve maintenance stations where equipment is stored. These are all owned by the county. The largest is in Waterloo and major repairs to equipment are made here. The county has gradually done away with the heaviest equipment and substituted lighter equipment that may be operated at higher speeds and with equal effectiveness. The county has three Caterpillar No. 10 and two No. 11 Auto Patrols, two Adams gas motor graders, one Austin-Western gas motor grader, three Austin-Western motor graders with 10-12 International motors, one FWD truck with a St. Paul underbody hydraulic scraper, and every district has its own truck. There are two International 1½-ton trucks, one with a dump body and the other with a flat bed; four Chevrolet 1½-ton dump trucks; five 1½-ton Dodge dump trucks; and three FWD trucks. There are also the following tractors: one Caterpillar RD7, one RD8, two Allis-Chalmers Model L tractors, four Allis-Chalmers Model K tractors, and two RD5 tractors. One 10-foot pulled grader and two Adams 10-foot leaning-wheel graders are also on the roster. The county has a set of pile driver leads and a portable CMC hoist that is used with the pile driver. A dragline is rented as needed for bridge excavation and other work.

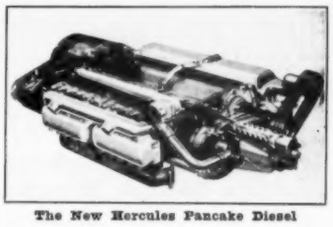
Black Hawk County operates two quarries almost continuously the year round. It recently purchased two Dempster-Dumpsters mounted on Dodge trucks, each equipped with six buckets, for use in transporting the material from the quarry floor to the crushers.

For snow plowing the county has three V-plows for the FWD trucks, six for the light tractors, and two for the Model L tractors. As yet there are no plows for the RD8 and RD7 tractors.

Pancake Diesel Engine Requires Smaller Space

A new model in the DFX series of Hercules diesel engines of horizontal or "pancake" design has been announced by Hercules Motors Corp., Canton, Ohio, primarily for applications where there is limited space requiring engines of minimum height. While differing in general design from the better known Hercules vertical engines, these heavy-duty models are of relatively light weight. Two of these three 6-cylinder models develop 176 and 191 hp at 1,800 rpm and the third 193 hp at 1,600 rpm.

Special attention was paid to the design of the engine to assure proper lubrication. The oil capacity is exceptionally large, due to the use of an oil tank built directly into the oil pan. A scavenging pump keeps the sump of the engine dry and delivers all of the oil into the tank from which the pressure lubricating oil pump draws its supply through a large area screen. The oil is delivered through a Nugent-type lubricating oil filter into the main header line of the engine, from which the different bearings and surfaces are supplied with ample lubricant.



The New Hercules Pancake Diesel

The other features of these engines, as well as the details of their dimensions, may be secured direct from Hercules Motors Corp.

Now is the time for a complete overhauling of your equipment, with a view to replacing obsolete units for next season's work. Write for further details on the new equipment described in this issue.

'Ramsey'
3-SPEED ALL-STEEL HAND WINCH

2 Sizes

5-ton capacity — 135-lb spools, 325' of ½" cable, $75.
3-ton capacity — 75-lb. spools, 150' of ½" cable $55

POWER FOR HEAVY LOADS. SPEED FOR LIGHT LOADS. Gear Ratios: 25:1, 4:1, 1:1.

Write for circular and name of nearest dealer

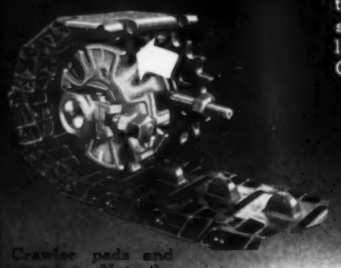
A few territories are open for live distributors

Manufactured by
RAMSEY MACHINERY CO.
1626 N. W. THURMAN STREET, PORTLAND, OREGON

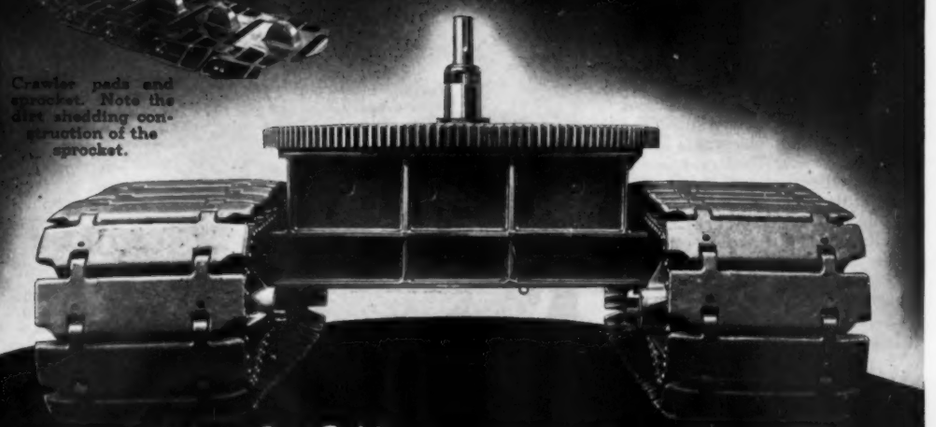
WHY DO MARION CRAWLERS WIN THE PRAISE OF EVERY MARION OWNER?

MODERNIZE with MARIONS

Every buyer of a Marion shovel, dragline, crane, clamshell or trench hoe expresses keen enthusiasm over MARION CRAWLERS. They like the way these CRAWLERS travel over uneven ground without locking or binding—how they pull through any material without clogging. They like the idea of using manganese steel for crawler shoes as this reduces the bending and breaking of belts to a minimum. • MARION CRAWLERS are built with tapered open pockets in the driving sprockets to prevent material from packing in and to make them self-cleaning. The double flanged rollers will not collect dirt. Ample clearance between the crawler belts and the bottoms of the side frames provides a dirt shedding action in travel that prevents any delay caused by clogged crawlers. • MARION CRAWLERS should be one of the determining factors in your decision to MODERNIZE with MARION



Crawler pads and sprocket. Note the dirt shedding construction of the sprocket.



THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.
Shovels · Draglines · Cranes · Clamshells · Trench Hoes · Walkers

Highway Tunnel Built by County

New Oregon Scenic Highway Contains Sharply Curved Tunnel and Required Some Elaborate Rock Work

✦ JUST outside of the city limits of Portland, Ore., rises Rocky Butte, affording a splendid view of the city, the surrounding plain to the north and east and of the distant Columbia River. A scenic highway is now nearing completion, which twists and spirals its way to the top of the 700-foot eminence. There are in reality six projects represented in the work, grouped together and commonly spoken of as "the hill." They include the roadway, retaining walls, tunnel, quarry, stripping the site for the county quarry to be located there, and N. E. Hancock Street improvement (approach to Butte).

This scenic highway and tunnel are of especial interest, the former because of the great amount of rock retaining wall, nearly all cemented masonry, with 1 in 12 batter, principally, and cut stone copings on the parapets. The new road clings to the sides and winds to the top, crossing itself on the way down by means of the tunnel. There are approximately 2 miles of road, nearly all protected by retaining walls of varying height. Twenty thousand cubic yards of hand-trimmed stone went into the walls, the result being one of the largest and most spectacular examples of rock work of this type in the United States.

On the way up or down, whichever way you wish to look at it, for this is a two-way road, there comes a point where transition to the 92nd Street grade could not have been accomplished without undue lengthening of the route except by this tunnel, which carries part of the road under another part. At this point, the road makes a very short loop, of which the tunnel comprises about half.

Tunnel Work

This tunnel is 322 feet long, 34 feet wide and is approximately 21 feet high at the center of the arch. In that length, it makes a 70-degree turn, the radius being 80 feet, making it one of the sharpest tunnel curves known. The grade in the tunnel is 5 per cent.

Material through which the tunnel is driven is basaltic rock, rather soft and requiring heavy timbering throughout. The first 20 feet of each end is volcanic, and the rest of the way mud seams were encountered. Blasting was necessary all the way through, using 40 and 60 per cent gelatin with 1 to 10 delays.

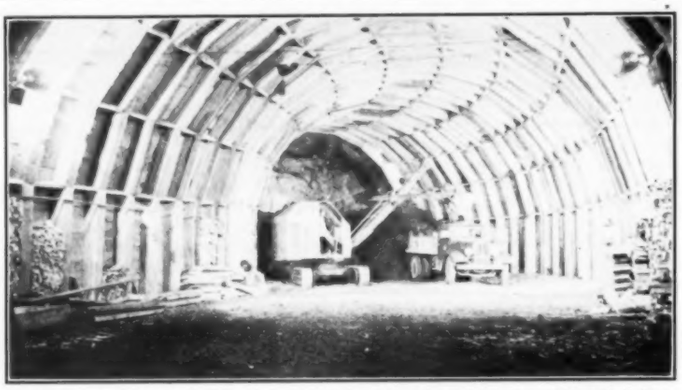
Approximately 12 feet a week was made, using an Insley ⅜-yard shovel at the face, loading into trucks. The total excavation, exclusive of portals and footings, was 10,240 cubic yards. The footings required 66 cubic yards in approximately 650 feet. They were poured with quick-setting cement, dowel pins being set at the same time. A pilot tunnel was first driven to check alignment, for ventilation and to permit dropping of the top segments.

Some costs on this part of the work will prove interesting, including labor and materials.

Tunnel excavation, 10,240 yards, $176.63 per foot, for 322 feet.
Timbering and lagging, using 202,000 feet of lumber, $80.14 per linear foot.
Packing, 90 cords of fir wood, $3.57 per foot.
Footings excavation, 650 linear feet approximately, $6.81 per foot.
Excavation for portals totaled $1.684.

The total of the above items, exclusive of portals, amounts to $267.15 per linear foot, from which gross is to be subtracted $27.00 per foot for tools, contingencies, etc.

An 8-inch concrete lining was placed inside the tunnel. For the purpose, a



Timbering in Rocky Butte Tunnel, with a Shovel Working at the Face. Although Only a Few Yards into the Tunnel, the Exceptionally Short-Radius Curve Is Already Evident.

Ransome 14-cubic foot air placer was used, operating at 90 pounds pressure, and served by a CMC Silver Streak mixer of ½-cubic yard capacity. Air was supplied by a 465-cubic foot Chicago Pneumatic compressor. The run was only about 40 feet.

Sectional forms faced with plywood were used, being 22-inch x 12-foot panels for the tangents and one moveable form for the curve. This was 13 feet in the center, 10 feet 3 inches on the short side and 15 feet 9 inches on the long side. About 30 feet per week was poured on the average.

The tunnel will be fully lighted, for in spite of the comparatively short length neither end is visible from the other. The system was designed by William Brust, Multnomah County electrician. It embodies Daybrite recessed lights with glass hinged covers, four and two lights to the fixture, the wattages to be determined later by experiment.

Overhead, there are double rows of lights. Ten on each end are 4-light units for intensive illumination at transition from daylight, while there are six sets of two's in the middle. Daybrite tunnel lights are also located on the sides, well up, at about the spring line, recessed and with guards over the glass. There will be electric eye control for the overhead lights only, to be used during low traffic periods.

Personnel

All six are WPA Projects with Multnomah County, Oregon, the sponsor. J. D. Shirley, Senior Engineer, Portland Area WPA, was in charge, with M. L. Sullivan, Resident Engineer, Al. Fake, Instrument Man, and A. C. Galbraith, Superintendent of "the hill." For the sponsor, George W. Buck is Road Master for Multnomah County, with his Chief Assistant, Paul C. Northrup, assigned to the work, Edw. Smith being in charge of the tunnel lining.

New District Offices For Asphalt Institute

The District VII Field Office of The Asphalt Institute of New York City has been moved to the Dwight Building in Kansas City, Mo. Frank S. Gilmore, formerly of the Kansas State Highway Department, continues in charge as District Engineer for the territory extending to Missouri, Iowa, Kansas and Nebraska.

The Field Office for District VIII has been moved from Dallas, Texas, to 214 Littlefield Building, Austin, Texas, with D. D. Williamson, formerly head of the Texas State Highway Department Laboratories, in charge as District Engineer for Texas, Arkansas and Oklahoma.

Quarry Plant Layouts In New Smith Bulletin

Smith Engineering works, 4014 N. Holton St., Milwaukee, Wis., has recently published a very helpful bulletin "Telsmith Quarry Plants" which develops a quarry plant from the simplest type of rock-crushing plant with a jaw crusher, elevator and vibrating screen, driven from one power unit, through all of the variations to an ideal high-capacity quarry plant, with dimensions and all necessary data for choosing the proper equipment. Telsmith semi-portable plants are also included. Copies of this Bulletin 267-D, may be secured free on request.

Rubber Joints Used On Two Florida Roads

Two new stretches of paving on U. S. 1 in Florida are to be equipped with a new type of rubber highway expansion joint filler, expected to reduce annual highway maintenance costs as much as $125.00 per mile. These new fillers, made of rubber strips by The B. F. Goodrich Co., Akron, Ohio, replace bituminous filling in expansion and contraction joints. Installed with a snug fit in the joints, these fillers eliminate repouring and do away with mushroomed joints where the bituminous material is extruding.

More than 30,000 feet of the new filler is to be installed near Daytona Beach, Ormond and Port Orange, Florida, and an additional installation is to be made in West Florida, at Cottondale, near Marianna. The Florida contracts are the result of approved test installations in Washington, D. C., Ohio, Indiana, Nebraska and on the Pennsylvania Turnpike.

Universal Atlas Co. Celebrates 50th Year

The month of November, 1939, marked the 50th anniversary of the beginning of operations of what is now the Universal Atlas Cement Co., a United States Steel Corp. subsidiary. A predecessor unit was the first to use and develop the rotary kiln in cement manufacture, and to make commercial use of powdered coal in the production of clinker. It was also the first to use plaster of Paris (now gypsum) to regulate the setting time of portland cement, as well as the first to develop the use of granulated blast furnace slag, instead of clay or shale, in the manufacture of portland cement.

Other firsts include the introduction of the first high-early-strength cement and one of the first to introduce pure white portland cement. It was also the first cement company to develop organized safety education for cement plant workers and to organize cement and concrete research.

NON-CLOGGING SELF-CLEANING CRAWLERS...

—And to prove that the New Buckeye Clipper has them, you can actually shovel sand, gravel and stone into the crawler where it engages the sprockets and you can not clog the chains, crawler belts or sprockets. Think what this means to you.

Remember too, you get MEVAC POWER CONTROL only on Buckeye Clipper Excavators, the metered vacuum power control system that is never affected by temperature changes . . . and works "as smooth as steam."

1/2 YARD
5/8 YARD
3/4 YARD
SHOVEL
CRANE
CLAMSHELL
TRENCH HOE
DRAGLINE
PILE DRIVER

Buckeye Clipper
FULL REVOLVING
CONVERTIBLE EXCAVATORS

THE BUCKEYE TRACTION DITCHER CO., SHOVEL DIVISION, FINDLAY, OHIO
Send at once complete information and prices on . . .

☐SHOVEL ☐DRAGLINE ☐TRENCH HOE ☐CLAMSHELL ☐CRANE
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PATENTED AND MANUFACTURED BY
THE BUCKEYE TRACTION DITCHER COMPANY
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BUILDERS OF
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EARTH HANDLING AND ROAD BUILDING EQUIPMENT FOR OVER 40 YEARS

New Literature on Convertible Excavators

Details of construction and design which characterize the Osgood Type 60 excavator are set forth in a new catalog recently issued by the Osgood Co., Marion, Ohio. Detailed specifications of the several models available in this type, Model 600 and Model 605, are given in two additional bulletins. This shovel is convertible to dragline, clamshell, crane and hoe and is available with gasoline, diesel, oil or electric power. According to the manufacturer, liberal use of alloy steels and anti-friction bearings increase efficiency and reduce operation costs.

Copies of Catalog 3906 describing the Type 60 and the two bulletins giving complete specifications for the 1-cubic yard Model 600 and the 1¼-cubic yard Model 605 may be obtained direct from the manufacturer.

Improved Hydraulic Pumps For High Pressure Service

The Watson-Stillman Co., Roselle, N. J., has recently issued Bulletin C-37, describing W-S Stediflo hydraulic pressure pumps in standard sizes from 2 to 100 hp, for pressures of 1500 pounds per square inch and upwards, using oil, water, or any other hydraulic medium.

Stediflo pumps are different from those of the reciprocating plunger type, as they represent a combination of the "swash-plate" form of operating mechanism with conventional packed plunger and poppet valve features, insuring compactness, enclosed operating parts, minimum pulsation in delivery and high mechanical efficiency. The pump is direct-connected through a flexible coupling to a gear-head motor. The power unit is entirely separate from the hydraulic end and is also fully enclosed. Adequate lubrication is provided and, as long as the proper oil level is maintained, lubricating troubles are practically eliminated.

Palm Made General Manager Of Davey Compressor Co.

The appointment of Arthur C. Palm as General Manager of the Davey Compressor Co., Kent, Ohio, has been announced recently. For the past three years Mr. Palm has been sales promotion and advertising manager of Davey and prior to his present affiliation was production manager of Campaigns, Inc., a national advertising service.

BUILD YOUR ROADS AND KEEP THEM CLEAR

with the same "Caterpillar" Diesel Equipment

THE same "Caterpillar" Diesel Tractor you put behind a bulldozer — or in front of a big carrying-type scraper — to widen roads, knock off humps, eliminate blind spots or cut down grades next spring, can "double" behind a heavy-duty snow-plow next winter.

The same easily operated "Caterpillar" Diesel Motor Grader you use for maintenance scraping, blading surfacing materials, pulling ditches, sloping banks, leveling fills, preparing subgrades — even to handle many tough construction jobs — can likewise be used to whisk aside ordinary snowfalls.

Such versatility enables county and municipal highway departments to handle all their improvement projects and maintenance work with minimum equipment. No big outlay for an assortment of units of limited uses!

And yet, keeping busy is only one kind of economy "Caterpillar" Diesel equipment offers to taxpayers and to public officials who pride themselves on thrifty highway-budget administration:

Look at its operating savings — through the use of low-cost fuel — efficiently utilized. Think of its modern design, quality materials, sturdy construction — for long-life stamina and dependability. . . . Consider *all* the advantages you get and you'll have no difficulty deciding that "Caterpillar" Diesel Tractors and "Caterpillar" Road Machinery are the equipment to choose — and that NOW is the time to buy them.

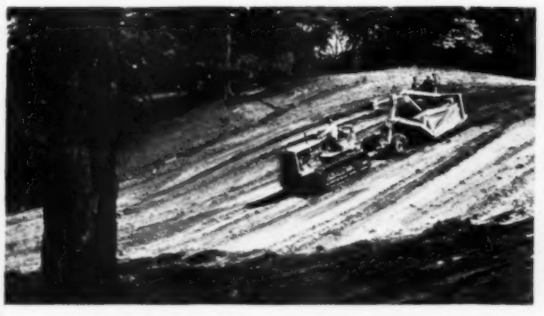
CATERPILLAR TRACTOR CO. • PEORIA, ILL.

CATERPILLAR

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

1 A "Caterpillar" Diesel D7 Tractor (same model as shown with snow-plow) with La Plant-Choate roadbuilder, widening a county road—a safety improvement!—in the mountains of Maryland. Also pulls grader, ripper, wagons, etc.

1 A "Caterpillar" Motor Grader cutting bank, ditching and smoothing on a Kansas road-widening (safety) job. Works fast—forward or backward without turning. In 8-hour day uses only 16 gallons of 7c fuel.



2 A "Caterpillar" Diesel D7 Tractor pulling a 6-yard Le Tourneau scraper, stripping overburden from gravel pit, near Mansfield, Ohio. Tractor consumes only about 2 gallons of 8½c fuel per hour, working 8 hours per day.

2 A "Caterpillar" Motor Grader ditching and spreading on a Wyoming road. With two complete rounds, covers a mile in 3 hours. In 10-hour day uses 2 gallons of 7c fuel per hour. (Three popular "Caterpillar" Motor Grader sizes—Nos. 12, 112 and 212.)

3 A "Caterpillar" D7 Tractor with La Plant-Choate snow-plow clearing heavy drifts near Poskin, Wis. (10 to 15 ft. drifts are common here.) Working 24 hours a day, uses only 2½ gallons of 6c fuel per hour.

3 A "Caterpillar" Diesel Motor Grader with V-plow opening a 4 to 6 ft. Colorado drift weighted with blown dust. Plenty of power for heavy going, yet versatile—capable with its blade equipment to clear away lighter falls with ease and speed!

Ventilation, Lighting For Turnpike Tunnels

(*Continued from page 15*)

also eliminates any projections in the tunnel which might damage a car temporarily out of control.

A low, rounded continuous curb is built between the opposing lanes starting where the center 10-foot safety strip narrows to 5 feet and extends right up to the portal so that the opposing traffic will be continuously separated. For a distance of 255 feet outside of the portals the roadway crown is gradually increased from 1 foot in 11 feet 6 inches, which is standard for the major portion of the tunnel, up to 2 5/16 inches in 11 feet 6 inches, in order to provide speedier drainage of the roadway at the portal. This additional crown is then taken out in the next 100 feet back of the portals in the tunnel.

Traffic leaving the tunnel is immediately provided with two 12-foot lanes and outside of this the 10-foot shoulder or berm has a bituminous surfacing which furnishes an approach to a garage and also provides space for stalled vehicles as well as an area where the emergency equipment, which will be installed at one entrance of each tunnel, can be readily maneuvered.

The concrete for tunnel lining uses the same sand grading as for highway contracts and coarse aggregate in two sizes, from 4-mesh to ¾-inch and from ¾ to 1½-inch. The minimum cement content per cubic yard of concrete is 1.6 barrels.

Ventilation and Lighting

The entrances to the tunnels are enlarged or flared, both in width and height, for a distance of 100 feet back from the adit, giving an additional 25 feet in height at the entrance which is reduced to the standard 14 feet 4 inches. This enlargement at the portal admits some daylight and makes the transition from daylight driving to driving in artificial illumination more gradual. The type of light to be used for illuminating the tunnels had not been announced at the time of the preparation of this article.

Artificial ventilation is to be provided by forcing air downward from the ducts in the ceilings. Ventilation buildings are being constructed of concrete with brick partitions and a steel decked roof above and as an integral part of the portals at both ends of each tunnel, with the exception of the short Rays Hill tunnel which will only have one such building. Each building will be equipped with two large fans electrically driven. At roadway elevation a coal heater will be installed and a standby generator for lighting the tunnel in case of failure of the power supply. A special towing truck will be located at one end of each tunnel.

Subgrade Drainage

A very carefully planned system of subgrade drainage is being installed to insure the stability of the subgrade throughout the length of the Turnpike. French drains and perforated pipe are used, as well as reinforced-concrete, triple-strength vitrified-clay and even cast-iron pipe. The 10-foot center strip is used in cuts for the installation of the drainage system with laterals as needed. All drainage is carried to the low sides of super-elevated curves and is picked up every 300 feet with inlet culverts. In the longer cuts plain concrete pipe from 18 to 36 inches in diameter is run longitudinally to collect run-off. Then 13 to 18-inch cast-iron or reinforced-concrete pipe is run transversely to connect with the main drainage system in the center strip. Many miles of 8 to 12-inch triple-strength perforated vitrified-clay

A Section of Finished Grade on Contract 33 Awarded to Adam Eidemiller of Greensburg, Pa. This Contractor Used a Bucyrus-Erie 10-B ¾-Yard Dragshovel to Cut the Trench for Drainage Tile across the Pike.

pipe is being used in the shoulders to collect and carry off underground water adjacent to overhead structures and in cuts.

In those sections where the main drainage system is not carried to the center strip, a 6 or 8-inch vitrified-clay pipe covered with 24 to 36 inches of coarse aggregate is installed beneath the center strip to trap melted snow and rain and carry it away so that it will not be able to seep under the edge of the pavement and render the subgrade unstable.

Cuts and Fills—Problems and Sizes

With over 24,000,000 yards of ledge, disintegrated rock and earth excavation and borrow, the grading and making of cuts and fills assumes major importance on this project. The largest cut on this job, and believed to be the largest ever made in Pennsylvania, is in Clear Ridge Mountain near Everett. The open cut has a maximum depth of 153 feet, 380 feet wide and 2,600 feet long, requiring the removal of 1,130,000 cubic yards of earth and rock. The next largest cut is through Mt. Dallas Ridge, southwest of Everett, through 106 feet of earth and rock and 800 feet long. Most of this cut is in solid rock with slopes of ½ to 1, making the width at the top 184 feet. The Mt. Dallas Ridge cut amounts to 1,115,000 cubic yards. The third largest cut is near Mt. Joy, towards the western end of the project, in Westmoreland County, 97 feet deep, 300 feet wide at the top, and containing 500,000 cubic yards. Other big cuts in Westmoreland County include one 50 feet deep and 1,760 feet long, one 48 feet deep and 2,600 feet long, and then there are some large fills in the same county running 60 feet high and 1,000 feet long and another 76 feet high and 2,400 feet long.

Somerset County, lying to the east of Westmoreland County, has some very large cuts and fills, two of the former of which replace South Penn Railroad tunnels which have been abandoned. Quemahoning Tunnel is replaced by an 83-foot cut 1,250 feet long while Negro Mount, which had an old tunnel, is bypassed by a cut 67 feet deep and 1,500 feet long just to the south of the old tunnel. Bedford County is close to the center of the project and where the Turnpike leaves Bedford County at its west border and enters Somerset County there is an 80-foot cut close to a 78-foot fill 1,422 feet long and then another 70-foot fill followed by a 95-foot cut. In the approach to Allegheny Tunnel on the east is a 60-foot cut; then two more the same size, one 1,250 feet long followed by another 1,700 feet long near Laurel Hill Tunnel at the Westmoreland-Somerset County line.

About the heaviest excavation on the Turnpike is in Bedford County in the Juniata River Valley. The gorge of the Juniata River is a break in a mountain range otherwise unbroken for a distance of 70 miles. In this narrow gorge are

(*Continued on next page*)

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Cuts, Fills and Structures On Pennsylvania Turnpike

(*Continued from preceding page*)

located the Lincoln Highway, a rural state highway, two major cable lines, a cross-country gasoline pipe line, a high-tension power line, a branch of the Pennsylvania Railroad and the 100-foot channel of the Raystown Branch of the Juniata River. At this point the Turnpike is located high on the side of Mt. Dallas. In this county there is a 65-foot cut ½ mile long and then a 58-foot cut close by. West of the big Clear Ridge cut mentioned above there is another cut 50 feet deep and 2,300 feet long and east of that a 55-foot cut near a 55-foot fill 1,000 feet long.

In Fulton County to the east of Bedford County and just west of Tuscarora Tunnel is a 35-foot cut 1,200 feet long and other cuts ranging from 42 to 47 feet. These, we believe, give a picture of the extent of heavy excavation.

All earth fills are laid in 8-inch layers and rock in 24-inch layers with maximum 18-inch rock and all fills are rolled with 10-ton rollers during spreading of the layers. Where the new Turnpike fills are run over some of the old South Penn Railroad fills, the old fills are first benched to insure against sliding. As a safeguard against rock falls and slides, the cuts are generally sloped 1 to 1 and if the cuts are more than 50 feet deep they are terraced or benched, with the benches sloping back from the cut and the surface water removed at the next low point. Diversion ditches are also run along the top of all cuts back of the slope treatment similarly to remove surface water. Where the backslopes come in contact with the overburden, the so-called slope treatment is applied. This consists of a rounding off of the top on 6, 10 or 20-degree curves, depending upon the natural slope of the ground, and back of this slope treatment the secondary ditches are placed. The 6-degree curve is used on natural ground where the slopes run from 1½ to 1 to around 2½ to 1; the 10-degree curves are used where the slopes range from 3 to 1 to around 6 to 1; and the 20-degree curves are used where the slopes run to —6 to 1 to down to —2 to 1.

On fills up to 8 feet deep, the Turnpike engineers are not installing any guard rail, but the fill is carried out on a slope of 4 to 1 to give a safety slope on which an automobile can be readily brought under control without turning over.

Structures and Viaducts

A very definite endeavor was made to keep the elevation of the Turnpike above all possible flood crest and although, in this particular case, the cost of excavation was somewhat increased, the cost of structures was reduced in like amount. Of the 130 drainage structures on the Turnpike there are only twenty-nine over 25 feet in length and only fourteen having a span greater than 50 feet. Of the 299 bridge structures on this project 169 are built in the interest of safety and the facilitation of traffic by separating the Turnpike from all cross-traffic upgrade.

The most important structure is the 600-foot New Stanton Viaduct in Westmoreland County. It is a spandrel arch structure 60 feet above the valley and spans two highways, a railroad and Sewickley Creek. Next is the Juniata River Viaduct near Bedford, a 500-foot structure carrying the highway 26½ feet above the river. Just to the west of this is the Dunnings Creek Viaduct 425 feet long. Other structures are smaller but by their number have made the building of structures on the Turnpike one of its major operations.

Interchanges

There are ten clover-leaf intersections or interchanges, including the two termini of the Turnpike, at which there will be toll booths. At each of these interchanges accelerating and decelerating lanes are being built to permit traffic to enter the highway at Turnpike speed and to leave the highway and reduce their speed to that customary on the intersecting roads. The construction of these interchanges has necessitated the further construction of a considerable number of overpasses and underpasses and extra drainage structures to carry intersecting roads across the Turnpike at another level. Numerous relocations of township and state highways have been necessary to make their approach to and their crossing of the Turnpike easy and safe.

Safety During Construction

When it is realized that the construction of the Pennsylvania Turnpike will be completed well within eighteen months from the time the first construction began, one can realize that the motto of every contractor and engineer on the job has been "Speed." We all know that speed tends to create unsafe working conditions and realizing this full well, the Commission appointed a Safety Engineer who watches, advises and cautions contractors constantly against unsafe conditions on their jobs. These cautions run all the way from advice to put an extra laborer on to turn down the nails in old form lumber scattered about the job, to telling a tunnel contractor that he couldn't leave a 4,400-

(*Concluded on page 35*)

C. & E. M. Photo

One of the Turnpike's Many Culverts with Brick Lining at the Base Because of the Acid Mine Drainage

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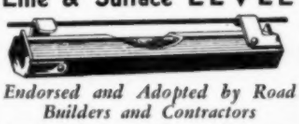

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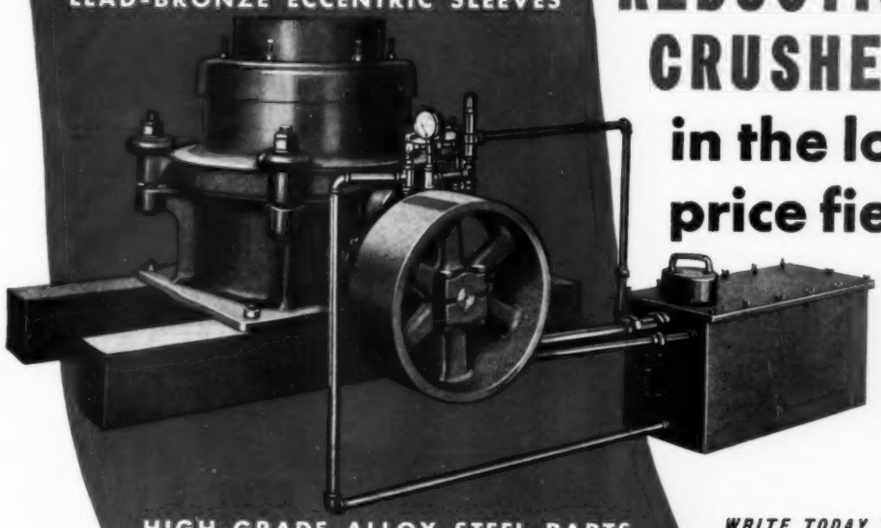

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Edited by A. L. H. STREET, Attorney-at-Law.

Penalties For Not Obtaining Licenses

The trick bicyclist who rides amongst a lot of bottles on a vaudeville stage without knocking any of them over has a "cinch" compared to the contractor as he tries to get through a maze of matters pertaining to the making and performing of contracts without some one of them bowling him over for a financial loss!

Just one of the many points on which a contractor must be on the lookout pertains to licenses to engage in business. And he must be on the lookout, not only in the city and state in which his principal place of business is situated, but also in every other city and state in which he may do business.

If the penalty for failing to take out a license, when required, consisted merely in the payment of a fine or in accepting public hospitality in some local jail for 30 days, overlooking these license requirements might not ordinarily bring about disastrous consequences. But when it comes to risking every dollar spent and earned on a job, that's something different.

Not every failure to secure a license invalidates a contract, but *it is up to the contractor to ascertain for himself, first, whether a license is legally required, and, second, what can happen to him if he fails to obtain one.*

New Laws—New Risks

Formerly, license taxes imposed against contractors were usually exacted to secure public revenue. Nonpayment of revenue taxes is uniformly held by the courts not to forfeit the right to collect pay for work done nor to invalidate a contract taken by the delinquent taxpayer. But where a license is required as a means of establishing fitness of a person to engage in an occupation—whether it be that of a lawyer, doctor or contractor—or as a means of guarding the public against being imposed upon by dishonest pursuers of an occupation, the courts generally hold that one who has violated a requirement for securing a license can not recover on his contract.

In a Tennessee case, a subcontracting company was denied right to collect a balance due for road work, because no state and county license had been obtained. (Tennessee Good Roads Co. v. Putnam Construction Co., 11 Tenn. App. 485.)

And an Arizona contractor found himself "behind the eight ball" for want of a license, when he tried to enforce a construction contract against the owner. (Hunt v. Douglas Lumber Co., 17 Pac. 2d, 815.)

Visiting Corporations

The individual contractor, like any other natural person who is a citizen of this country, is guaranteed by the Federal Constitution the right to go where he pleases in this broad land and to take employment without unjust discrimination against him on account of his being a citizen of another state. Not so with corporations. They have no fixed right to cross boundary lines for the purpose of doing business in another state—excepting business that constitutes interstate commerce. In short, each state has the right to prescribe the conditions on which corporations organized in other states may do a local business.

Clearly, construction work is intrastate, not interstate, business. So no construction company should undertake work in any state other than that in which it was organized without first posting itself as to the licensing requirements of that particular state.

In some cases it will be found desirable to secure a license before even submitting a bid on a job, in order to forestall a court dispute as to the validity of the bid. But it has been decided in Illinois and other states that not only may an unlicensed foreign corporation make a valid bid on a job, but that it may also make a valid contract for future performance of work, and secure its license before the work is commenced. (Ebinger v. Breese, 240 Ill. App. 80. Automotive Material Co. v. American Standard, etc., Corp., 327 Ill. 367, 158 N. E. 698). In the last cited case, the Illinois Supreme Court aptly observed: "Ofttimes a foreign corporation may have occasion to bid for a job in its line of business that would mean to it contemplated profits, but if it had to be licensed before it could bid on such a contract, or contract to do such work, the opportunity to do the same would be gone. To hold that it had to be licensed before it contracted for or secured business to be done would be unreasonable."

Some Adverse Decisions

In a Missouri case tax bills were issued to a non-resident corporation in payment for street paving. One of the bills was transferred to a resident of Missouri, but he lost his suit to collect on the bill, because the paving contract was void. The company was not licensed to do business in Missouri, and the plaintiff could have no better right to sue than the company would have had. (Flinn v. Gillen, 10 S. W. 2d, 923.)

In a Virginia case, an unlicensed non-resident company claimed that it had not done such business in the state as obligated it to secure a license there—that it had engaged in interstate commerce when it furnished additions to a gas plant. But the Supreme Court of Appeals decided that it was a construction contract, involving the furnishing of labor and materials, and therefore an intrastate transaction. (Western Gas Construction Co. v. Commonwealth, 136 S. E. 646.)

We do not by any means intend to say that foreign corporations have always been licked when they attempted to collect pay for work done without having first secured a license. We are principally concerned in pointing out the importance of carefully checking in advance on whether or not a license is required to protect the right to collect for work done in a particular state. We also emphasize the point that usually it is cheaper to secure a license than to win a lawsuit over the necessity for securing one.

For example, in a case passed upon by the United States Circuit Court of Appeals for the Fifth Circuit, it was decided that an Alabama company that undertook but one road subcontract in Tennessee was not required to secure a license there, under the laws of Tennessee. (Consolidated Indemnity & Insurance Co. v. Salmon & Corwin, 64 Fed. 2d, 756.) On the other hand, it has been decided that under the statutes of Wisconsin, a contract made by an unlicensed non-resident company is void even though the company had not embarked upon any other venture in that state.

In some states, but not others, it is decided that invalidity of a contract, because made by an unlicensed corporation, cannot be cured by obtaining a license after the work has been done. On this point, see the decision of the Wyoming Supreme Court in the case of Interstate Construction Co. v. Lakeview Canal Co., 224 Pac. 850.

A close study of decisions bearing on this general subject shows that widely differing conclusions have been reached by the courts of different states. In a measure, this is due to the lack of uniformity in the language of the statutes of different states. But, even where the statutes of two states are worded substantially the same, there is often a conflict in the conclusions reached by the highest courts of the respective states. All of which brings us to the point that wading into business in a new state is like wading out from the shore of a lake for the first time. It pays to inquire in advance how the footing is as far out as you intend to wade.

Route Surveying for Our Major Utilities

The second edition of the compact volume on "Route Surveying," by George Wellington Pickels and Carroll Carson Wiley, Professors of Civil Engineering, University of Illinois, has recently been released by John Wiley & Sons, Inc., New York City.

The first edition lifted surveying from merely a railroad procedure and broadened its field to include pipelines, transmission lines, etc. This useful text has been further broadened by revisions in several of the chapters on circular curves and spirals, particularly the latter, which is a source of considerable argument among engineers in regard to highway location, and the chapter on earthwork has been completely revised. Both students and engineers in practice will find this second edition of value and service. Price, $3.50.

Soil-Cement Construction For Streets and Highways

A very thorough-going construction handbook has been published by the Portland Cement Association, 33 West Grand Avenue, Chicago, Ill., on soil-cement roads, giving an outline of the laboratory and testing procedures necessary to insure successful work, field control methods for resident and soils engineers, and a very careful delineation of each step in the construction of this type of road.

This 88-page manual should be in the hands of every state, county and township engineer and resident or construction engineer responsible for the construction of light traffic roads, as it can be used for both study and reference. Our readers may secure copies of this handbook without cost by mentioning this magazine.

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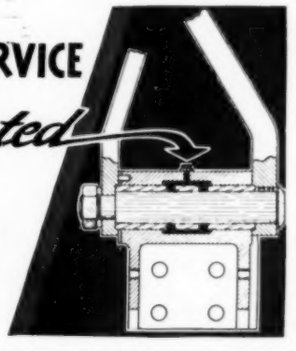

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One of Roy L. Houck's Tournapulls Hauling and Spreading Gravel on a Road Job in Oregon

Gravel Surfacing With Scraper Unit

Gravel surfacing has been handled in many ways in the past, but it remained for Roy L. Houck, an Oregon contractor, to develop a brand new method on a long-haul gravel-surfacing job on U.S. 97 near Klamath Agency, Oregon. Houck placed two Tournapulls on the job and with their 30-cubic yard heaped capacity Carryalls they loaded the washed river gravel, hauled it from 300 feet to 4 miles and spread it in the required lifts of 6 inches, making the complete operation cycle by one machine. The travel of the Tournapulls back and forth compacted the fill.

This machine, which hauls a load at a speed up to 20 miles an hour, this way performs three distinct operations that usually require a different type of equipment and an operator for each operation.

Acetylene Generator Is Readily Portable

The new Oxweld MP-9 medium-pressure acetylene generator, recently announced by The Linde Air Products Co., 30 E. 42nd St., New York City, is designed to combine portability with the operating advantages usually found only in larger units. The MP-9 weighs only 129 pounds and can readily be moved about in a shop or in the field. It holds 25 pounds of size 14 ND Union carbide and will deliver as much as 50 cubic feet of acetylene an hour at any desired pressure to 15 pounds per square inch. Several hours of continuous welding or cutting on all except the heaviest work can be obtained from one charging.

The manufacturer states that this generator produces a smooth flow of clean dry acetylene with no appreciable variations in pressure, which is particularly valuable in maintaining a stable blowpipe flame. Operation of the generator is simple, since only one handle is used to start or stop generation, and to adjust the delivery pressure. After starting, operation is fully automatic.

Other features include two relief valves, one for the generating chamber and the other for the hydraulic backpressure valve; a large hydraulic backpressure valve, to prevent the carrying over of water to the hose and to check any reverse flow of gases; and an interference mechanism which allows only the proper sequence of operations during recharging. The generator is constructed of welded steel parts.

Further information on this generator may be secured by interested contractors and state and county highway departments direct from the manufacturer or from this magazine.

New 1940 Trucks

The Federal Motor Truck Co., Detroit, Mich., will enter the 1940 season with the broadest coverage of the truck field it has ever offered, its new line consisting of 39 models ranging from light speedy ¾ tonners up to super-heavy-duty units for the heaviest hauling requirements.

In addition to the complete line of conventional models from ¾ to 8-ton, there is also a group of cab-over-engine trucks from 1½ to 5½-ton, a series of 13 six-wheelers with ratings from 2 to 8 tons and several other models for special services.

The ¾-ton Federals are offered in 4 and 6-cylinder models, the chassis being identical in design and construction, and in wheelbase lengths of 102, 111, 119 and 128 inches. Conventional models from 1½ to 5½ tons in size and the cab-over-engine trucks within this capacity range are of the same general specifications, the only difference being in the front end construction. The six-wheelers include conventional and cab-over-engine types with single or tandem drive and all of these models have Timken rear-end units.

Huge Equipment Tire Weighs 2,600 Pounds

Pneumatic tires, weighing more than 2,600 pounds each and capable of carrying a load of more than 36,000 pounds apiece, are now in regular and exclusive production by Firestone Tire & Rubber Co., Akron, Ohio, for use on the latest types of earth moving equipment.

These tires, the largest ever produced by the rubber industry, stand more than 9 feet high and have a cross section close to 3 feet. The tube in one of these giant tires weighs 150 pounds and the protecting flap more than 50 pounds. It has 34 plies of gum-dipped fabric, but only requires 35 pounds of air pressure. The four tires on each piece of earth-moving equipment have a load capacity of 75 tons.

Harvey S. Firestone Jr. Beside One of the Giant Tires for Earth-Moving Equipment Now in Regular Production

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Canal and Levee Work By Clamshell Dredge

(*Continued from page 2*)

W. F. Powers, Naval Architect of Chicago, Ill., and the hull has storage tanks for oil and water.

An unusual feature of this dredge is that in addition to the hull as described above, there are two detachable pontoons, each 8 feet wide and 140 feet long, which are bolted on either side of the hull. For the work on Item B, where the dredge was digging ahead and placing the spoil on the starboard bank and hence working close to that bank, both pontoons were bolted to the port side of the main hull. This gives greater stability to the dredge and reduces the rocking or rolling which is not only a discomfort to all on board but when working close to a bank induces erosion very rapidly and possible undermining of the bank which must be replaced under the specifications.

The dredge has three spuds, two located 42 feet from the front edge of the hull working through spud wells. The third spud is located aft. The spuds are built of steel, the two front ones being 36 x 36 inches x 75 feet long, while the rear spud is 30 x 30 inches and 70 feet long. There are separate engines for each spud.

The power plant is comprised of two fire-tube boilers of 150 bhp and 125 bhp capacity, using industrial fuel oil and delivering saturated steam at 120 pounds pressure. The engines include a 60-hp Marion steam hoist engine, a 75-hp Bucyrus swinging engine, two Marion 40-hp spud engines forward and a 25-hp rear spud steam engine. A 25-hp Worthington diesel drives a 10-kw generator, while an Engburg vertical steam engine drives a second 10-kw generator.

The boom is 28 x 28 inches x 200 feet long and constructed of Douglas fir timber. The plumb reach is 192 feet, while the effective reach off the barge is 167 feet. It is used at a working angle of 180 degrees and swings a 5-cubic yard California-type clamshell bucket. The dredge operates on a 45 to 55-second cycle, giving an average of 59 swings per hour, or a production of 7,000 yards in 24 hours. The slight delays from the ideal cycle are caused by the need for periodic moving ahead. The net tonnage of the Alabama is 563 tons.

Personnel

A typical crew on the dredge Alabama is the Captain, one civil engineer and clerk, three operators, three firemen, three oilers, three deckhands, one cook, one assistant cook, one cabin boy, one dishwasher and one boatman. Grover French is Captain. The work on the Charenton Drainage and Navigation Canal is under the jurisdiction of Lieut.-Col. William F. Tompkins, District Engineer, Second New Orleans District, U.S. Engineer Department.

Welded I-Beams Replaced Wood on County Bridge

When it was found necessary, in order to insure the safety of the traveling public, to replace the wood decking supports of a bridge in Miami County, Ohio, M. A. Gantz, County Surveyor and Engineer, decided on arc welding as the method.

Eight 12-inch stringers of standard I-beams were welded on the bridge structure, using a Hobart 200-ampere gasoline-engine-driven arc welder. Eight gallons of gasoline and 50 pounds of Hobart No. 55 3/16-inch shielded electrodes were required for the job, which was completed in 7 hours. The county officials were so pleased with the job after inspection that plans are now being made to rebuild and strengthen other bridges throughout the county.

A Hobart 200-Ampere Arc Welder Was Used in Welding the I Beams Which Replaced Wood Decking Supports on a County Bridge

East River Tunnel Is Holed Through

The final blast of the last 10 feet of rock which holed through the Queens Midtown Tunnel under the East River, New York City, was fired November 8 and marked the completion of probably the most difficult of all Manhattan's many tunnels. In spite of the obstacles encountered in forging this latest link in New York's chain of under-water arteries, traffic engineers say that the tunnel will be well worth the $58,000,000.

The construction of the new tunnel presented many difficulties from which the contractors on the Holland and Lincoln tunnel were free. The East River bed at the point chosen for the Midtown tunnels is underlain by a wavy rock stratum. As a result, the tunneling proceeded for much of the way in mixed earth and rock, which is more difficult than in full face rock or in silt.

In the construction of the under-river portion of this twin-tube tunnel, 53,000 cubic yards of earth, 97,000 cubic yards of rock, and 93,000 cubic yards of mixed earth and rock have been taken out. Driving the two tubes consumed approximately 390,000 pounds of 40 and 60 per cent special gelatin dynamite, of which 260,000 pounds were used for the 97,000 yards of rock. The average for the whole job was 2.68 pounds of explosive per cubic yard of rock and 1.40 pounds per cubic yard of mixed earth and rock.

The completed portion of the tunnel under the river will require 64,000 cubic yards of concrete, 1,300 tons of reinforcing bars, 2,000 tons of structural steel, 55,240 tons of cast-iron lining, 11,000 tons of structural steel lining, 467,000 high-tensile-steel bolts for the lining, and 175,000 square feet of glass tile for the ceiling.

In order to prevent too steep a grade in the tunnel or too long approaches, the plans provided that it should run at a level which would bring the tops of the tubes above the bottom of the river bed at one point on the Manhattan side. At this point it was necessary to raise the river bottom by dumping clay which was covered with riprap to provide the permanent cover required for the protection of the tunnel.

In order to provide a cover over the tunnel to counteract the uplifting effect of the pressure of compressed air used in driving the tunnel, it was also necessary to provide a temporary blanket of clay during shield-driving operations. Approximately 215,000 yards of clay was dumped, first in the westerly half of the west channel of the river. This was later picked up and used again in the easterly half of this channel. This clay was then picked up again and used twice more on the Queens side.

THIS MAN KNOWS ENGINEERING PUBLICITY

—he really does know the What, the How, the Where of it. He writes the lucid and informing story that editors and readers want to see printed; is a splendid contact man and has a remarkable background in general business, sales development and public relations. For interviews, address: Box 224, CONTRACTORS AND ENGINEERS MONTHLY, 470 Fourth Avenue, New York City.

The Walsh Construction Co. of Davenport, Iowa, contractor for this project, is headed by Thomas J. Walsh, President. John S. Macdonald is Chief Engineer. For the New York City Tunnel Authority, Ole Singstad is Chief Engineer and William McK. Griffin, Deputy Chief Engineer.

New Hydraulic Jack

A new type of jack, known as a variable-speed jack and incorporating the hydraulic principle used in other Buda jacks, has been announced by The Buda Co., Harvey, Ill. One of the features of this jack is the fulcrum on the lever socket. Adjustment of the fulcrum center changes the length of stroke on the lever bar and consequently changes the speed at which the load is raised or lowered. The power required to lift the load changes with the speed. Because of this feature, the jack can be used for 10, 15 or 20-ton loads.

Another advantage of this feature, according to the manufacturer, is in running the ram up to the load. By changing the fulcrum center to its lowest power requirement, the speed is increased while the ram is being raised to the load. After the load is reached, the fulcrum center is changed to actual load capacity, and full load is then lifted in short easy strokes. In lowering, it is merely necessary to open a release valve. The load is held at all times under complete control of the operator.

This new design provides a much wider range of power and speed with a comparatively few sizes of jacks, the manufacturer states. Complete information on this Buda variable-speed jack is contained in an illustrated bulletin No. 965, copies of which may be secured direct from the manufacturer.

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Write for Particulars Bulletin T-260

Uniform Standards For Prequalification Of Road Contractors

Uniform state standards for the qualification and prequalification of highway contractors have been prepared and recommended by the Joint Cooperative Committee of the American Association of State Highway Officials and the Associated General Contractors of America. The qualification standards are designed to measure the responsibility of contractors bidding on highway construction and have been recommended to avoid the difficulty and expense to contractors of maintaining financial records to comply with the varying requirements of the states and to permit greater freedom in the exchange of information between states. These standards are based on the belief that the responsibility of contractors does not change substantially from state to state, and that there should be reciprocity between states in the qualification of contractors.

The standards define liquid assets of contractors and current liabilities. Upon the difference or net liquid assets is based the amount of work contractors are qualified to undertake. In addition, experience is also taken into account. For more than two years of highway-contracting experience, contractors will be qualified to undertake work equal to five times the net liquid assets. Premium ratings based upon experience and past performances may increase the amount to eight times the liquid assets.

The Joint Committee, which includes a representative of the Public Roads Administration, has been in existence more than three years. In August it agreed upon a tentative set of standards and sent copies and questionnaires to contractors and state highway departments for comment.

Of the thirty-six state highway departments which replied, thirty were entirely favorable or suggested certain details for further consideration; three suggested extensive changes; three were noncommittal; and none expressed specific disapproval. Of the replies from contractors, chiefly from local chapters of the Associated General Contractors, twenty-four expressed entire approval or approval with certain modifications; two expressed definite opposition; and none were noncommittal.

On October 4, the Joint Cooperative Committee met in New York City and voted to recommend adoption of the slightly modified set of standards. The following day, the Associated General Contractors governing and advisory boards adopted the committee recommendation.

On October 9 in Richmond, Va., the Joint Committee recommendations were presented to and approved by the Road Construction Committee of the American Association of State Highway Officials. Further steps necessary for complete adoption will be taken as rapidly as possible.

Roadways of Steel

Indicative of the progress made in the study of the use of steel in roadways is a report just released by the American Institute of Steel Construction describing tests made on a thin asphaltic roadway surfacing for battledeck floors for highway bridges. A battledeck floor is the name commonly applied to a flat steel plate welded to supporting beams, and functioning as a part of the compressive area in the structure.

In 1936 there was completed at Lehigh University a series of strength tests of battledeck floor panels. These tests, performed under the supervision of the Committee on Technical Research of the American Institute of Steel Construction, were intended to furnish data leading toward the economical structural design of battledeck floors for highway bridges. Following the publication of the results of European tests on thin bituminous wearing surfaces applied to steel plates, such material was obtained and applied to the full-size battledeck panel used in the Lehigh stress distribution tests, and subjected to traffic and weathering in a roadway, the results being embodied in a progress report.

To the battledeck floor in the recent test was applied an asphaltic covering approximately ⅜-inch thick, and consisting of a mixture of crushed stone, sand, portland cement, water and a special emulsified asphalt. The site selected for the test was the curve in a heavily traveled roadway leading in from the main gate at the plant of the Bethlehem Steel Co. at Bethlehem, Pa. The plate was placed close to the curb on the inbound side of the roadway. The asphaltic material supplied by the Flintkote Co. for this test was its liquid asphalt special Extratite C-13-E. All mixtures using this material are applied without heating.

After 18 months of heavy usage no disruption of the bond between plate and asphalt have been observed, and present indications are that the test appears to have demonstrated that such surfacing will adhere satisfactorily to steel under the test conditions. It is further interesting to note that the test panel shows no sign of rutting under traffic. Some checking has taken place, but even in the checked areas there is no sign of separation between the plate and the surfacing material. The inspection report shows that early surface checking can be considerably reduced, if not entirely eliminated, by the use of graded aggregates and by moist curing.

The opinion of those who have inspected the plate recently was that it was in excellent condition for the type of surface used and that, if it continues to perform as it has to date, it should provide a bridge floor surfacing as satisfactory as any bituminous roadway covering and no more expensive to maintain. Also, no undue tendency for vehicles to skid on this surface was noticed at any time during the test.

Tait Appointed B-E Mgr. Of Pittsburgh District

Announcement has been made by the Bucyrus-Erie Co., South Milwaukee, Wis., of the appointment of J. F. Tait as District Manager of its Pittsburgh Sales District, with offices at 1502 Clark Building, Pittsburgh, Pa. Mr. Tait, who has been associated with Bucyrus-Erie for 22 years and who prior to this appointment was in charge of the Philadelphia office, succeeds P. B. Heisey.

New Rotary Air Grinder

A new 5½-inch 17-ounce rotary air grinder, known as the Bantam, has recently been put on the market by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This new Thor tool is described and illustrated, with a number of interesting close-up action photos, in a new circular which also contains full information on grinding wheels and accessories.

Copies of Circular P20 may be secured by those interested direct from the manufacturer or from this magazine.

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The New Allis-Chalmers Model IB Tractor Particularly Adapted for Highway Mowing

A New Wheel Tractor For Highway Mowing

The new Model IB industrial tractor recently announced by Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., is particularly adapted to handling highway mowers. It has 13.5 drawbar horsepower and weighs 2,140 pounds. This new model sets low on the ground and has the stability to haul up and down slopes without tipping. It has both a foot brake and individual hand brakes on the rear wheels, and three forward speeds and one reverse.

The structural steel frame surrounding the engine and radiator permits the mounting of snow plows, brooms, compressors or highway mowers. For power, the tractor has an 18-hp heavy-duty medium-speed tractor engine equipped with a muffler and foot accelerator, and can be equipped with numerous accessories such as a power take-off, belt pulley, generator, lights and wheel weights.

New District Salesman For Novo Engine Co.

A new factory representative for the southwestern district of the United States, the Rocky Mountain district and the western coast, has recently been appointed by Novo Engine Co., Lansing, Mich. Norman H. Boardman, the new representative, will work with Novo distributors in this territory and will take with him the new Novo display trailer which carries several operating pieces of Novo equipment, including engines, pumps and compressors.

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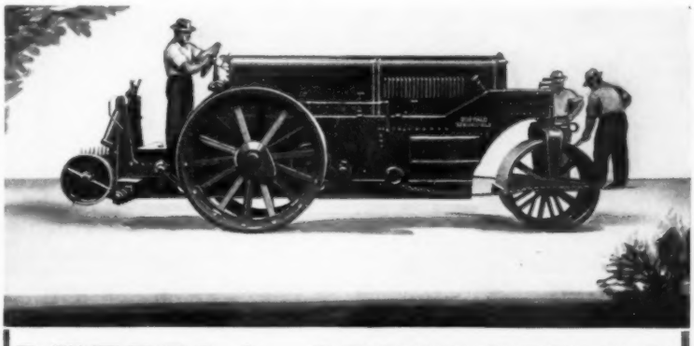

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Make Wire Ropes Do Double Duty

Rope Retired from Active Duty on Equipment Can Be Used for Clearing, Towing And Other Services

By F. L. SPANGLER, M. E.

✦ HOW to use up the odds and ends of discarded wire rope is always a question with those who use a great deal of cable. Some ideas along this line have been offered by Henry Hoover of the Midwest Construction & Asphalt Co., Chicago, Ill., a firm which regularly replaces the wire rope on its cranes, shovels, draglines and other equipment. Frequent regular inspections generally reveal whether a wire rope has about reached the end of its useful life for the particular piece of equipment and duty to which it is assigned. When a rope is marked for retirement, it is removed at the first opportunity, which means the first time the equipment is returned to the yard or is idle long enough to make the replacement.

The discarded rope is stored in the contractor's yard until some use is found for it, and it is surprising the many and varied uses to which Midwest puts its discarded rope. Some of it is cut up into standard lengths and on one end of each length of rope is fastened a ring and to the other end a hook. Thus the rope is quickly transformed into a tow rope for trucks and tractors. Many times these tow lines come in handy when a truck breaks down, or gets stalled with a heavy load and needs the pulling power of one or more tractors.

These ropes are also convenient for clearing land. To uproot a tree on which the surface roots have already been cut, a ½ or ¾-inch cable attached to a tractor will usually bring the giant to the earth in less than a minute. Midwest has often used old rope on contract jobs involving the clearing of land, and the hauling away of trees, stumps, or other heavy loads such as stone boats.

On a recent river contract, this same contractor found it necessary to build a long pier out into the river. They depleted their entire stock of retired wire rope to find lengths that would permit them to anchor the pier to the bluffs along the river.

When rope has reached such a state of wear or old age as not to be useful where it must perform particularly hard service, it comes in handy for tying down equipment shipped on flat cars.

Watch the Ravelling

Rope of practically any construction is useful for some of the purposes suggested. Of course, when working with discarded rope on operations where the factor of safety is very small, one can expect the rope to be parted by any severe shock load. Some ropes when broken will ravel for a distance of 20 feet or more when the break occurs suddenly while the rope is under load, while other ropes will show little or no tendency to ravel. This is one of the basic differences between preformed and non-preformed rope, the former being particularly adaptable to use as hoist cables which must work over small sheaves, as preformed rope resists the bending fatigue better than non-preformed rope. On the other hand, dragline cables are almost universally non-preformed and their retirement is brought about by wear of the crown wires rather than by fatigue breaks of the individual wires.

It has been found by Midwest that in general preformed cable has greater salvage value and affords easier handling because worn and broken crown wires in the preformed rope do not ravel, leaving short protruding wires to jab workmen's hands.

No doubt there are hundreds of other uses to which worn wire rope has been put, and the uses described in this short article may suggest many others. Contractors may find many applications for salvaged rope in their miscellaneous operations with a view to seeing where discarded wire rope can be utilized.

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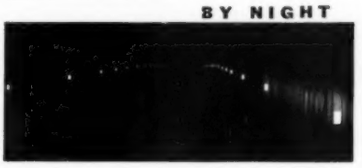

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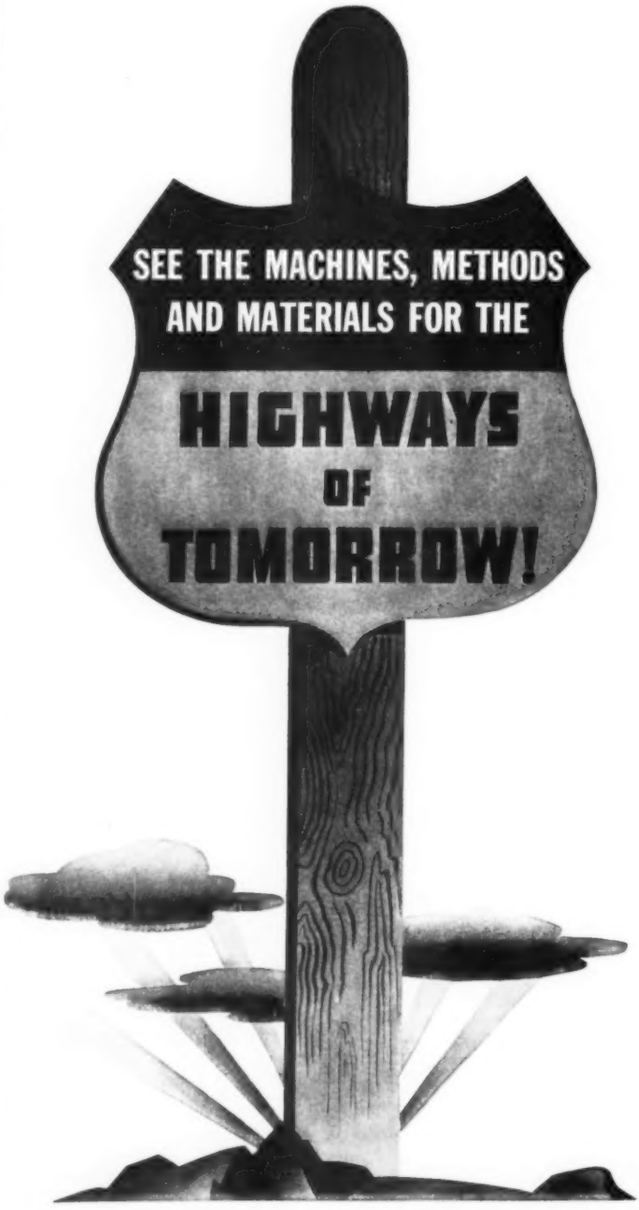

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Maintenance Methods For Surface Treatment

(*Continued from page* 18)

cement-stabilized base, a prime coat of tar is applied to the base after it is cleaned. If the base has been stabilized with bituminous material, or if a surface treatment or other old surface is to be retreated, the tar prime coat is omitted. A tack coat consisting of approximately 0.15 gallon per square yard of RC-type cut-back asphalt is used in all cases. Equal quantities by weight of coarse aggregate and fine aggregate are used. Coarse aggregate consisting of ½-inch to No. 16 sieve material is applied on the top of this tack coat and the fine aggregate consisting of coarse sand or washed screenings (maximum 20 per cent passing a No. 50 sieve) is spread on the coarse aggregate. In some cases a mixed aggregate, graded from ½ inch to No. 50 sieve, is used and this material is placed in one application. The aggregates are allowed to air dry; cut-back asphalt sufficient to increase the quantity to approximately 0.60 gallon per square yard in the 50-pound treatment is then applied, and the materials are mixed in place. The purpose of using the aggregates and asphalt in these proportions is to get a non-skid treatment dense enough to be waterproof. Usually a multiple-blade drag is used but blade graders have been used successfully. A finishing machine, made from a combination of multiple-blade drags placed side by side and an adjustable screed board extending over the entire width, is used. This machine makes only one trip, thus eliminating turn-arounds. Usually, this type of treatment is closed to traffic until the volatile portions of the asphalt can evaporate sufficiently to prevent displacement under traffic. During this time, the treatment is rolled at least once with a 5-ton tandem roller.

Maintenance

A surface-treated road should not be constructed unless provisions are made for adequate maintenance. The treatment itself is simply a thin protective roof covering the base. The base carries the load. A small hole or crack in the bituminous surfacing will allow rain water to penetrate and soften the base. This will quickly damage adjacent areas, and the failure spreads rapidly.

In order to protect the base from surface water and sub-surface water, our maintenance forces spend considerable time cleaning ditches and correcting drainage conditions. Sometimes in the winter, the bituminous surfacing on an old project cracks at places where there is a slight movement or yielding in the base. As soon as these cracks are observed, in order to protect the base from surface water which will cause softening of the base, they are covered immediately with an inverted penetration seal. All holes in the bituminous surfacing are patched promptly with material similar to that used in the original surfacing. Sometimes it is necessary to replace the base material adjacent to the hole with better material before making the patch. We have used sand asphalt for this purpose in many places where the base was of sand-clay construction. Low places or settlements are usually brought up to the grade with pre-mixed sand asphalt and covered with a surfacing similar to the original surfacing. Thus it is evident, with the exception of repairing settlements, practically all of our routine work is done to protect the base from water. The rainfall in South Carolina varies from 40 to 60 inches annually.

Each winter a study is made of our surface-treated roads to determine those to be retreated during the following season. The retreatment work is usually carried on between the first of May and the last of September. Five years is about the average life of a retreatment, but much of our surface treatment work is in good condition much longer than this. The retreatment not only adds thickness to the old surface, but it adds life or flexibility. The old treatment becomes thinner and more brittle with age.

Before the retreatment is applied, an inspection is made to see that all holes have been patched and all major depressions have been built up to the general grade of the surface. The condition of the old surface treatment determines the quantity of material to be used in the retreatment. The 50-pound mixed-in-place treatment, described earlier, is the most common type; but, in some cases, heavier treatments are used on very rough old pavements in order to get a smooth riding surface. The road is usually kept closed to traffic from 2 to 6 days; but, if necessary, the road may be opened immediately for ordinary traffic by spreading 4 or 5 pounds of sand over the treatment.

Costs

The average costs for surface treatment during the past 5 years are as follows:

Double bituminous surfacing (20 feet wide)	$3,449.50 per mile
Single bituminous surfacing (20 feet wide)	1,478.36 per mile
Mixed-in-place treatment (20 feet wide—retreatment mostly)	1,400.00 per mile
Maintenance—annual cost (surfacing alone)	76.87 per mile

The retreatment cost, distributed over a 5-year period, is $280 per mile. This, plus the routine maintenance cost of $76.87 per mile, makes a total maintenance cost of $356.87 per mile per year, which should keep this type of surfacing in good condition for an indefinite time.

From a paper presented at the Twelfth National Asphalt Conference.

Suggestions for Better Rock-Drill Operation

The preparation of drill steel in the blacksmith shop is one of the vital factors in the efficient and economical operation of rock drills and has an important bearing upon the cost of rock drilling. The elimination of delays and reduction of drilling costs make close attention to drill shanks well worth while.

Gardner-Denver Co., Quincy, Ill., has used the motto "Successful rock drilling starts in the drill-steel shop" for many years and in continuance of its policy of aiding hard-rock men to get more out of their drills, the company has recently issued a very helpful booklet containing a discussion of striking-face failures of tappets and piston hammers, copies of which will be sent free to contractors and rock-drill men on request if they will mention this item.

Western Sales Manager For Caterpillar Co.

The appointment of V. H. Wallace as Western Sales Manager for Caterpillar Tractor Co. of Peoria, Ill., to succeed the late H. H. Chambers, has been announced recently. Mr. Wallace, who will have his headquarters in San Leandro, Calif., has had considerable experience in the newspaper business as advertising salesman and Advertising Manager for the Fresno, Calif., *Republican*. In 1927 he became affiliated with the advertising department of Caterpillar Tractor Co. For a period he was Assistant Advertising Manager at Peoria and then in January, 1933, was transferred to the Western Sales Division as District Representative, with headquarters at Los Angeles, and then San Leandro. In 1935 he was appointed Agricultural Sales Manager of the Western Division, with headquarters at Spokane, and in November, 1938, became Assistant Sales Manager at San Leandro.

Welding Specifications In Convenient Booklet

The tentative specifications for iron and steel arc-welding electrodes, approved by both the American Welding Society and the American Society for Testing Materials, are included, with other useful material, in a 24-page booklet, prepared by The McKay Co., York, Pa.

This booklet also contains advice on the proper choice among different mild-steel electrodes, according to the nature and conditions of the work, in chart form, together with comparisons which are equally helpful to users of McKay shielded-arc welding electrodes, or any other brand. Copies of this booklet E-16 may be secured from The McKay Co. by interested readers free on request.

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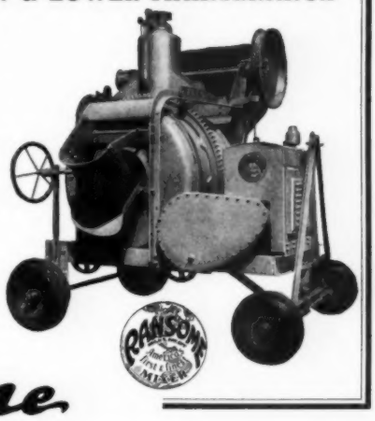

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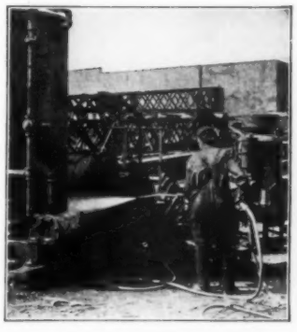

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Road Use Doubled, A 20-Year Program

Speaking before the American Institute of Steel Construction, Paul G. Hoffman, President, The Studebaker Corp., dramatized the need of greater safety on our highways and the requirements of future highway transportation. Mr. Hoffman believes that the use of cars in this country—not their number, but their use—will easily double in the next 20 years. Instead of getting 250,000,000 vehicle-miles with 30,000,000 cars and trucks per year, we will get 500,000,000 vehicle-miles with 40,000,000 cars and trucks, provided highway travel continues to grow safer and more facile. That proviso is important because it envisions a rebuilding of our highway system and, most particularly, a drastic improvement in the facilities for motorized travel in our metropolitan areas.

Our road program has gone through several phases since the impact of the automobile created a demand for improvement. First the cry was for hard roads—"Get us out of the mud!"—and then for wide roads. Today there is a growing realization that we need safe roads, roads so designed that motorists can travel rapidly and entirely without hazard.

It goes without saying that the modernizing of our street and highway facilities is a tremendous undertaking. It will cost not less than $25,000,000,000 to provide the 25,000 miles of new highways we need outside the cities, and at least another $25,000,000,000 to make a good start toward modernizing street facilities within our cities. This $50,000,000,000 job won't be done in a day, or even a year; it will take 20 years at least.

Fifty billion dollars is an enormous sum even in these days of astronomical figures. Quite obviously, street and highway construction and reconstruction is the biggest new industry on the horizon. Despite the tremendous sums involved, there is nothing fantastic about the program from a financial standpoint. Federal aid might be required for land acquisition, but existing tax rates with the increased use of motor vehicles would provide sufficient revenue both to amortize the land costs and for complete construction on a pay-as-you-go basis. One change in financial policy would be required; namely, the limitation of diversion of the proceeds of motor taxes to other uses.

The fact that money will be available for the job is of itself no assurance of an orderly development. A plan is needed to determine the character and sequence of projects. Fortunately the facts are now available on which such planning can be based. Under the direction of Thomas H. MacDonald, Commissioner, Public Roads Administration, and with the cooperation of forty-six highway departments, a $10,000,000 survey has just been completed. For the first time in history we know where our roads are, what kind of roads they are, how many use them, who use them, and why. Beyond this, estimates projected as far as 1960 have been made of potential traffic loads which must be carried by the highway system. By taking advantage of this factual material, construction can be so planned that it will meet not only present needs but those of the future; so that while a project may be local, it will fit into the master national plan.

No one can study these state highway planning surveys without coming to two conclusions. First, that our most pressing need is for improved facilities into and within our cities. Second, that there is ample warrant for spending huge sums of money to engineer safety into those highways where there is a heavy concentration of traffic.

Every mile of new wide highway in the country and the elevated or submerged highway in the city involves a tremendous cost, but the volume of traffic warrants this cost. It is a safe guess that when motorways are provided for our cities and when our 25,000 miles of new highways are available in the country, 80 per cent of highway travel will be concentrated on these facilities. Congestion will not only be relieved, but that 80 per cent of travel will be almost immune from accidents because it will be carried on accident-proof highways.

New Spray Gun for Cleaning Equipment

The new oil spray gun recently developed by the Alexander Milburn Co., 1493 W. Baltimore St., Baltimore, Md., is designed for removing caked grease and dirt from engines, and is equally efficient for spraying springs, shackles and other automotive parts.

This Type KSC gun is equipped with an unusually long nozzle for reaching ordinarily inaccessible places and uses kerosene or any other cleaning solvent, or lubricating oil. Air enters the gun through the handle and siphons the fluid from the cup. The delivery is controlled simply by adjusting the fluted nozzle; a knurled nut locks it in operating position. Any desired volume can be obtained, from an almost solid stream to a finely atomized spray. For dusting and drying purposes, the fluid is shut off entirely.

The construction of the KSC gun is very simple, with a die cast body and stamped steel reservoir. It is designed to be held and operated with one hand. The trigger is conveniently located and requires slight pressure to release the air or fluid.

Further information on the Milburn Type KSC oil spray gun may be secured direct from the manufacturer or from this magazine.

Spreaders for Road Work And Winter Maintenance

Bulletin 232, describing and illustrating Galion spreaders for road building and year-round maintenance, has recently been issued by the Galion Iron Works & Mfg. Co., Galion, Ohio, from whom copies may be secured upon request.

The line of Galion spreaders includes models for spreading asphalt uniformly to any desired depth; a stone spreader attached to a truck by chains for laying material in an even layer; a chip spreader suitable for use with a wide range of fine materials; a road-widening spreader which it is claimed makes a quick job of widening roads; and the highway sander, mounted on one rubber-tired wheel which provides the power for driving the unit, and which is available in two models. One of these is a standard heavy-duty model with operator's platform and the other is a lighter weight model for use where the truck driver also serves as operator.

New Tractor Booklet

The specifications and a description of the mechanical features of the Caterpillar diesel D6 tractor are included in a new 32-page booklet published by the Caterpillar Tractor Co., Peoria, Ill. A complete description of the diesel engine which powers the machine, with cutaway photographs and explanatory captions, as well as similarly handled sections on the transmission and track construction, is included. Many action photographs showing the type of jobs this tractor will handle, and owners' statements regarding costs and performance give an idea of the capacities of the D6.

Copies of this booklet, Form 5403, may be secured by interested contractors and state and county highway departments direct from the manufacturer or from this magazine.

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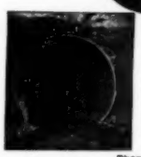
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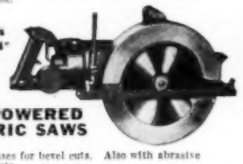
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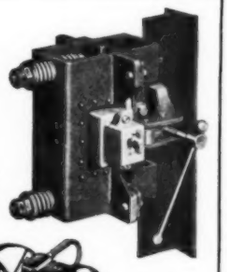

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THE SAFE FASTENING FOR WIRE ROPE

First Super-Highway Rushed to Completion

(Continued from page 23)

volt cable lying around loose from the portal all the way into the electric mucker and advising another contractor, who had wired his 110-volt tunnel lighting line to his spiral steel air line, to remove the light line and set it up with insulators immediately.

During the most intense part of the work only two major accidents occurred, one resulting in five fatalities, the other in no loss of life. In the very thorough inspection trip it was our privilege to make, driving over every foot of the Turnpike which could be traversed by automobile, walking other sections where a car could not get through, and carefully observing methods, we placed this huge high-speed construction project high in the lists of safely operated projects. Many of the details of safety measures will be discussed in the series of methods articles which will appear each month following this article.

Winter Work

In Pennsylvania there are comparatively few days during the winter when concrete can be poured without heating and when it is safe to lay any concrete paving. Work is usually stopped about November 15 and then started early in April. On the Pennsylvania Turnpike where fill operations were still going on in October, the suspension of paving during the winter will enable the new fills to settle and thereby provide a firmer base for the concrete paving when work starts again in the spring. As mentioned before, concreting in the tunnel can be continued throughout the winter because after aggregates and water are heated for mixing the concrete they are protected from outside weather after placing. Further, the portals of the tunnels can be hung with tarpaulin and thus a reasonable temperature maintained within.

Labor and Wages

As far as employment goes, the peak was probably reached about the middle of September, 1939, when nearly 13,000 men were employed by the contractors on the sixty-one contracts then under way, totaling around $40,000,000 for grading and drainage, excavation of tunnels, erection of bridges and concrete paving. Wages paid by contractors up to that time amounted to almost $3,500,000 and the employees of the Commission have received, from the inception of the work, over $1,250,000.

Contractors have worked three 8-hour shifts and some one 8-hour and two 7-hour shifts, using the two extra hours for greasing and maintaining equipment. Thus it is seen that night work is the rule, made possible by floodlighting equipment, usually from towers mounted on skids and equipped with portable electric plants, permitting the unit to be moved to keep up with the center of activity.

Contractors do all their own hiring, but in accordance with PWA regulations. Preference is given to people on relief rolls where such people are available and qualified for the work for which they are needed. Wages range from 52.5 cents an hour for unskilled labor to $1.40 for highly skilled labor and with an average of about 75 cents an hour. Prosperity has reigned between Harrisburg and Pittsburgh throughout the mountain country, as there has been no unemployment among able-bodied men for the past year.

Personnel

The Pennsylvania Turnpike Commission appointed by the Governor is composed of Walter A. Jones, Chairman, Frank Bebout, Charles T. Carpenter, Thomas J. Evans, and I. Lamont Hughes, Secretary of Highways, ex-officio member, with John D. Faller as Secretary-Treasurer and General Counsel of the Commission. Samuel W. Marshall is Chief Engineer; William T. Staats, Assistant to the Chairman of the Commission; James F. Murphy, PWA Engineer; Colonel F. E. Lanphere, R.F.C. Engineer; and J. E. Greiner Co., Consultant for the Commission and bondholders. Charles M. Upham, Engineer-Director of the American Road Builders' Association is Highway Consultant, Ralph Smillie of the Port of New York Authority is Consultant on Tunnels, and A. J. Sweet of New York, Consultant on Lighting.

A New Booklet on Quick-Use Concrete

A new 16-page booklet highlighting the advantages of modern quick-use concrete, made with Penn-Dixie high-early-strength cement, has recently been issued by the Pennsylvania-Dixie Cement Corp., 60 East 42nd Street, New York City. This booklet explains what high-early-strength cement is and lists the advantages and benefits of quick-use concrete. It also contains helpful data pertaining to cold weather concreting and the production of water-tight concrete. There are two pages of tables outlining methods for mixing and curing quick-use concrete under various weather conditions.

Copies of this new booklet T-10 may be secured direct from Penn-Dixie.

Contracts Awarded by the Pennsylvania Turnpike Commission

Contract No.	Section	Name of Contractor	Date Awarded	Amount of Contract	Type of Construction	Calendar Days to Complete	Length in Feet
1	19	L. M. Hutchison, Mount Union, Pa.	10-27-38	$ 458,058.80	Structures, Grading and Drainage	275	50,371
2	11 & 12	Girard Constr. Co., Inc., Philadelphia, Pa.	11-29-38	444,758.98	Structures, Grading and Drainage	230	50,476
3	19-A	C. T. Burket, Vineland, N. J.	12-20-38	115,627.24	Structures, Grading and Drainage	220	3,647
4	7-B & 8-A	Connell & Laub, Dayton, Ohio	1- 4-39	605,113.59	Structures, Grading and Drainage	200	35,376
5	19-B	M. Edward Wilt & Sons, Millersburg, Pa.	2-17-39	29,884.52	Structures, Grading and Drainage	135	1,304
6	15 & 16	C. J. Langenfelder & Son, Rosedale, Baltimore County, Md.	2-17-39	418,813.89	Structures, Grading and Drainage	180	36,490
7	4	Guthrie-Marsch-Peterson Co., Chicago, Ill.	3- 1-39	505,091.54	Structures, Grading and Drainage	250	9,417.96
8	15-A	Nello L. Teer, Durham, N. C.	3-14-39	132,495.06	Structures, Grading and Drainage	100	15,438.50
9	13 & 14	Empire Constr. Co., Baltimore, Md.	3-14-39	773,918.32	Structures, Grading and Drainage	225	28,785.57
10	8-C & 9-A	County Constr. Co., Carnegie, Pa.	3-20-39	663,164.64	Structures, Grading and Drainage	130	39,861.72
11	2	McCrady Constr. Co., Pittsburgh, Pa.	6- 7-39	354,072.13	Structures, Grading and Drainage	120	15,181
12-S2	S2	Arundel Corp., Baltimore, Md.	4- 3-39	2,444,527.25	Sideling Hill Tunnel and East and West Approaches	315	13,337.33
13-L2	L2	Hunkin Conkey Constr. Co., Cleveland, Ohio.	4- 3-39	1,920,281.48	Laurel Hill Tunnel and East and West Approaches	315	12,618.10
14	8B-2	Connell & Laub Constr. Co., Dayton, Ohio.	4-27-39	240,532.48	Structures, Grading and Drainage	100	16,109.89
15	16-A & 17	L. M. Hutchison, Mount Union, Pa.	4-27-39	429,781.78	Structures, Grading and Drainage	115	29,231.16
16	4-A	Frank Mashuda, Milwaukee, Wis.	4-27-39	582,711.21	Structures, Grading and Drainage	100	21,665.83
17	A2	Guthrie-Marsch-Peterson Co., Chicago, Ill.	5-12-39	2,672,188.40	Allegheny Tunnel and East and West Approaches	315	9,816
18	KB2	Bates & Rogers, Chicago, Ill.	5-12-39	2,920,123.00	Kittatinny and Blue Mt. Tunnel and East and West Approaches	315	12,400
19	.....	B. F. Sturtevant, Boston, Mass.	5- 4-39	217,330.00	Fans, Motors and Transmission for All Ventilation Buildings	315	.....
20	13-B	York Engineering Co., York, Pa.	5- 4-39	326,209.62	Viaduct and Grading and Drainage	200	4,071
21	13-C	York Engineering Co., York, Pa.	5- 4-39	315,406.36	Structures, Grading and Drainage	115	13,050
22	.....	Hen Johnston, Inc., West Reading, Pa.	5- 4-39	5,336.78	172 Unlighted Signs, 7 Lighted Signs for all Contracts	30	.....
23	3-B	Ferguson & Edmondson Co., Pittsburgh, Pa.	5-12-39	364,864.81	New Stanton Viaduct, Grading and Drainage	160	1,901
24	B2	Mason & Hanger Co., New York City	5-24-39	1,549,718.50	Rays Hill Tunnel and East and West Approaches	295	7,008.27
25	T2	B. Perini & Sons, Inc., Framingham, Mass.	5-24-39	2,055,939.67	Tuscarora Tunnel and East and West Approaches	295	10,846.77
26	3-A & 4-C	Guthrie-Marsch-Peterson Co., Chicago, Ill.	5-24-39	709,957.49	Structures, Grading and Drainage	130	34,429.62
27	13-E	N. R. Corbisello, Binghamton, N. Y.	7-20-39	882,710.48	Structures, Grading and Drainage	210	5,076
28	12-B & 13-A	M. Bennett & Sons, Indiana, Pa.	5-24-39	496,532.36	Dunnings Creek Viaduct, Grading and Drainage	200	6,825
29	18	C. J. Langenfelder & Son, Rosedale, Md.	6- 7-39	731,466.88	Structures, Grading and Drainage	120	50,352.29
30	S4	Ritter Bros., Harrisburg, Pa.	7-20-39	191,270.71	Ventilation Buildings, E. and W. Sideling Hill Tunnel	250	.....
31	L4A	Ritter Bros., Harrisburg, Pa.	7-20-39	95,548.05	Ventilation Buildings, E. Laurel Hill Tunnel	250	.....
32	2-B & 3A1	Ferguson & Edmondson Co., Pittsburgh, Pa.	6- 7-39	489,540.55	Structures, Grading and Drainage	120	22,845.04
33	5A	Adam Eidemiller, Greensburg, Pa.	6- 7-39	699,588.14	Structures, Grading and Drainage	120	27,920.37
34	5 & 6	George Vang, Inc., Pittsburgh, Pa.	6- 7-39	616,596.24	Structures, Grading and Drainage	100	29,166.50
35	11-B	N. B. Putman Co., Harrisburg, Pa.	6-19-39	164,955.98	Structures, Grading and Drainage	100	600
36	8C1 & 9A1	H. B. Dickens, Philadelphia, Pa.	6-19-39	138,466.87	Structures, Grading and Drainage	90	1,497
37	16-B	Dalton Bros., Inc., Paoli, Penna.	6-19-39	234,593.00	Structures, Grading and Drainage	90	10,373.01
38	18A & 19C	H. W. Shaull & Son, Mechanicsburg, Pa.	6-19-39	287,833.77	Structures, Grading and Drainage	100	26,000.61
39	19-D	Walker Bros., Chambersburg, Pa.	7-20-39	886,027.28	Paving Contract, Structures, Grading, R. C. Pavement	175	54,278.40
40	2-C	Baldwin Bros. Paving Co., Cleveland, Ohio	7- 6-39	415,736.70	Structures, Grading and Drainage	110	7,286.40
41	9C2, 10, 11A	Central Pa. Quarry Stripping & Constr. Co., Hazelton, Pa.	7- 6-39	1,561,920.63	Structures, Grading and Drainage	165	38,385.60
42	8B-1	Connel & Laub Constr. Co., Dayton, Ohio.	7- 6-39	642,295.94	Structures, Grading and Drainage	150	14,520
43	12A	Herman Holmes, Crystal Falls, Mich.	7-20-39	1,513,504.98	Structures, Grading and Drainage	150	37,646.40
44	13D	Nello L. Teer, Durham, N. C.	7- 6-39	795,244.27	Structures, Grading and Drainage	140	17,846.40
45	15B	Holt-McConnel & Osburn, Canonsburg, Pa.	7-20-39	52,222.74	Structures, Grading and Drainage	100	1,770
46	19E & 20	John H. Swanger, Lancaster, Pa.	8- 1-39	1,114,324.24	Paving; Structures, Grading and Drainage	280	35,354.70
47	20A	Johnson, Drake & Piper, Inc., Freeport, L. I.	8- 1-39	1,213,588.88	Paving; Structures, Grading and Drainage	280	28,411
48	14A	L. M. Hutchison, Mount Union, Pa.	8- 1-39	487,420.19	Structures, Grading and Drainage	220	14,362.34
49	7P1 & 8P1	Shullo Constr. Co., Akron, Ohio.	8- 1-39	681,650.29	R. C. Pavement, Grading	270	41,533.17
50	8P4 & 9P1	Union Paving Co., Philadelphia, Pa.	8- 1-39	730,711.14	R. C. Pavement, Grading	270	42,896.72
51	15P1 & 16P1	John F. Bloomer, Appleton, Wis.	9- 8-39	833,194.47	R. C. Pavement, Structures, Grading, Drainage	260	40,143.13
52	T4	Capitol Constr. Co., Hollidaysburg, Pa.	.....	178,030.00	Ventilation Buildings, E. & W. Tuscarora Tunnel	220	.....
53	K4 & B4A	Ritter Bros., Harrisburg, Pa.	.....	272,495.70	Ventilation Buildings, E. & W. Kittatinny Tunnel, W. Blue Mt. Tunnel	220	.....
54	.....	.....	.....	.....	.....	.....	.....
55	.....	.....	.....	.....	.....	.....	.....
56	8P3	Union Paving Co., Philadelphia, Pa.	9- 8-39	265,975.10	R. C. Pavement, Grading and Drainage	260	16,064.89
57	11P1 & 12P1	County Constr. Co., Carnegie, Pa.	9- 8-39	823,457.24	R. C. Pavement, Grading and Drainage	260	50,624
58	16P2 & 17P1	N. B. Putman, Harrisburg, Pa.	9- 8-39	596,634.10	R. C. Pavement, Grading and Drainage	260	31,684.26
59	15P2	W. L. Johnson Constr. Co., Hicksville, Ohio.	9- 8-39	382,441.13	R. C. Pavement, Grading and Drainage	260	20,275
60	2P1 & 3P1	William D. Vogel, Indianapolis, Ind.	.....	423,060.84	R. C. Pavement, Grading and Drainage	240	22,845.04
61	16P3	N. B. Putman, Harrisburg, Pa.	.....	240,132.32	R. C. Pavement, Grading and Drainage	240	10,965.68

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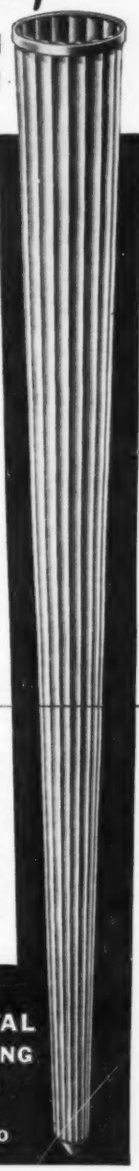

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Partial List of Structures for which Tapered Monotubes Were Specified in 1939

Hangars and Administration Building, North Beach Airport, New York City.
Municipal Auditorium, Zanesville, Ohio.
Sewage Disposal Plant, New Haven, Conn.
U. S. Navy Aeronautical Laboratory, Philadelphia, Pa.
Incinerator, City of Pittsburgh, Pa.
State College Building, Lansing, Mich.
Paper Mill (Hollingsworth & Whitney), Mobile, Ala.
Charity Hospital, Monroe, La.
Retail and Wholesale Market Bldgs., Kansas City, Mo.
National Orange Show Stadium, San Bernardino, Calif.
Calvin Coolidge High School, Washington, D. C.
Steam Plant (Northern States Power Co.), La Crosse, Wis.
Federal Housing Project, Brooklyn, N. Y.

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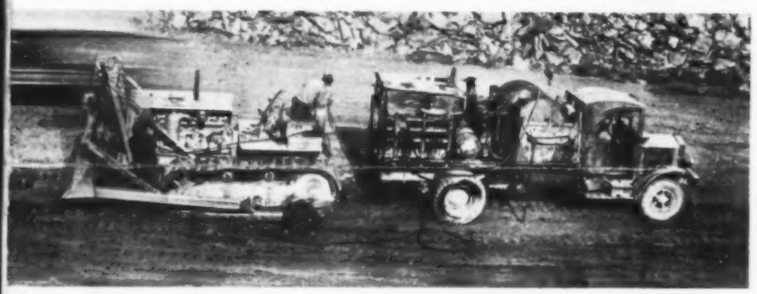
Contractors and Engineers Monthly

Activities Along the Pennsylvania Turnpike—Our First Super-Highway

Slicing Off a Piece of Hill with a Bucyrus-Erie Bullgrader Mounted on an International TD-18 TracTracTor on Contract 7, Section 4, Near Mt. Pleasant, Westmoreland County, Pa. This Contract for Structures, Grading and Drainage Was Awarded to Guthrie-Marsch-Peterson Co. of Chicago.

The Empire Construction Co. of Baltimore, Md., on Grading Contract 9, Near Breezewood, Pa., Used a No. 12 Auto Patrol for Grading and Sloping Banks. This Contractor's Fleet for Handling Rock and Clay Included Five D7 Tractors Pulling Athey 14-yard Side-Dump Crawler Wagons and one D8 Pulling 14 and 11-Yard Athey Wagons in Tandem. These Are Shown (In Insert) Being Loaded by a Koehring 1¾-Yard Shovel.

On This Same Job, Contract 7, Section 4, Guthrie-Marsch-Peterson Used a Skullcracker Swung by the Bucyrus-Erie 37-B crane, Shown at Right, to Break Up Oversize Rock Which Was Then Hauled to the Fill in Euclid 10-Yard Diesel-Powered Dump Trucks.



To Keep Its Equipment Running Smoothly, Guthrie-Marsch-Peterson Used This Portable Service Station to Lubricate, Refuel and Service All Equipment on the Job. The Truck Carries Two 6700 Alemite Guns for Gear and Tractor Roll Lubricant and One Alemite 6890 Oil Dispenser, an Air Compressor, a 500-Gallon Diesel Fuel Oil Tank and One 50-Gallon Gas Drum.

When Mason & Hanger Co. of New York City Was Setting Up Its Plant for Driving Rays Hill Tunnel, Contract 24, This Universal-Lorain Truck Crane Was First Used at the Railroad Siding to Unload Materials and Then to Erect the Plant at the Tunnel Portal.

Shullo Construction Co. of Akron, Ohio, Which Had Contract 49 for Concrete Paving and Drainage, Used This Barber-Greene Machine to Dig Trenches for Robinson Perforated Vitrified-Clay Drainage Pipe.

On One of C. J. Langenfelder & Son's Contracts for Structures, Grading and Drainage, the Caterpillar D8 and LeTourneau Carryall at Left Moved Average Loads of 22 Cubic Yards, Making 10 Trips an Hour on 500-Foot Hauls. A D8 with an Angledozer Acted as a Pusher for the Scraper During Loading as Shown Above.